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UNION OF SOUTH AFRICA.

DEPARTMENT OF AGRICULTURE.

REPORT

WITH

APPENDICES

FOR THE

YEAR ENDED 31st MARCH, 1919.

(EXCLUSIVE OF THE SECTION RELATING TO AGRICULTURAL EDUCATION.)

Presented to both Houses of Parliament by Command of His Royal Highness the Governor-General.

Price 7s. 6d.

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UNION OF SOUTH AFRICA.

DEPARTMENT OF AGRICULTURE.

REPORT

WITH

APPENDICES

FOR THE

YEAR ENDED 31st MARCH, 1919.

(EXCLUSIVE OF THE SECTION RELATING TO AGRICULTURAL EDUCATION.)

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Presented to both Houses of Parliament by Command of His Royal Highness the Governor-General.

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[U.G. 40—'19.]

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DEPARTMENT OF AGRICULTURE.

REPORT FOR THE YEAR ENDED 31ST MARCH, 1919.

(EXCLUDING AGRICULTURAL EDUCATION).

CONTENTS.

PAGES.

Report of the Secretary for Agriculture 1

Appendix I. Report of the Principal Veterinary Surgeon 33

„ II. Report of Chief, Division of Sheep 43

„ III. Report of Director of Veterinary Research 53

„ IV. Report of Superintendent of Dairying 59

„ V. Report of Chief, Division of Botany 61

„ VI. Report of Chief, Division of Tobacco and Cotton ... 81

„ VII. Report of Chief, Division of Horticulture 85

„ VIII. Report of Government Viticulturist 91

„ IX. Report of Chief, Division of Entomology 97

„ X.(*a*) Report of Acting Chemist 111

(*b*) Report of Agricultural Research Chemist 113

„ XI. Report of Librarian 121

„ XII. Report of Registrar, Agricultural Co-operative Societies ... 125

„ XIII. Report of Dry Land Agronomist 141

„ XIV. Report of Superintendent, Government Guano Islands ... 145

„ XV. Report of Chief Inspector of Grain 151

„ XVI. Report of Registrar of Brands and Controller of Fencing 159

„ XVII. Statement of Imports 161

XVIII. Statement of Exports 162

„ XIX. Statement of Imports and Exports of Animal Products ... 163

„ XX. Statement of Maize Exported 1910–18 163

„ XXI. Statement of Meat Exported 1910–18 164

„ XXII. Statement of Pedigree Stock Imported 1910–18 ... 164

„ XXIII. Statement of Sheep and Goats 1911–18 164

„ XXIV. Weather Conditions 165

„ XXV. Adulteration of Wines, Spirits and Vinegars, 1917–18 ... 169

„ XXVI. Statement showing position of Government Loans to Cape Co-operative Wineries 170

„ XXVII. Statement showing Grants-in-aid to Agricultural Societies 1918–19 170

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1918-19
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INDEX TO REPORT OF SECRETARY FOR AGRICULTURE, 1918-19.

	PAGE.
Accounts	1
Administration, Cost of	2
Administration, Cost of since Union	2
Agricultural Journal	24
Anthrax	10
Bee Specialist	21
Botanical Survey	18
Botany—Division of	16
Brands	26
Buildings	3
Bursaries	5
Chemistry, Division of	22
Citrus Canker	18
Co-operation, Division of	24
Co-operative Experiment	24
Cotton	18
Crisis ahead	6
Crop and Livestock Reports	28
Crops	28
Dairying, Division of	15
Department in Pretoria—Ground for Experiments and Housing of Scientific Division	3
Departmental Exhibit	30
Dry-Farming, Division of	24
Dual Capital, Difficulties caused by	7
East Coast Fever	11
Entomology, Division of	20
Expenditure, Causes of Increase in	2
Exports	26
Farm Foods, Fertilisers, Seeds and Pest Remedies Act	22
Farming in South Africa, New Era commencing	5
Farming Methods, Re-adjustment necessary	5
Fertilisers, Farm Foods, Seeds and Pest Remedies Act	22
Grading of Grain, Inland	25
Grain, Division of	25
Grain Elevators	25
Groot Constantia	20
Honorarium, to Sir Arnold Theiler	2
Guano Islands	25
Horticulture, Division of	19
Imports	26
Information Bureau	30
Inoculation against Horse Sickness, Insurance	15
Lamziekte	15
Land Bank	2
Legislation	27
Library and Publications	23
Livestock	29

PAGE.
Loans, Pre-Union .. 2
Locusts .. 21
Maize, Export of .. 25
Meat, Export of .. 11
Meat Commission .. 11
Oats, Export of .. 25
Parliamentary Under Study to Minister .. 7
Plant Introduction Gardens .. 22
Potato Seed .. 22
Poultry .. 30
Public Service, Efficiency of .. 8
Public Service Commission .. 7
Publicity Office .. 30
Research Chemist .. 23
Research Officers, Need for keeping up-to-date .. 8
Rinderpest .. 10
Salaries of Scientific and Technical Officers .. 7
Scab .. 12
Scab, Expenditure on .. 2
Settlers in need of advice .. 6
Soil Survey .. 23
Staff, Military Service .. 4
Staff, Requirements and procuring of Professional and Technical Officers .. 5, 6
Staffing of Department since Union .. 4
Stock Farming, Developments in .. 9
Tobacco and Cotton, Division of .. 18
Tuberculosis .. 10
University Faculties .. 5
Veld, Carrying capacity of .. 30
Veterinary College .. 30
Veterinary Division .. 9
Veterinary Officers, Need for more .. 10
Veterinary Research Division .. 14
War Affecting Personnel and Department's Activities .. 1
War, Benefit to country from .. 27
Weather .. 27
Wheat Growing, Departmental Committee on .. 29
Viticulture, Division of .. 19
Wines, Spirits and Vineyards, Adulteration of .. 27
Wool .. 13
World Markets, South Africa, Competition in .. 6
Youth, Officers not to occupy important positions if not initiative .. 8

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UNION OF SOUTH AFRICA.

ANNUAL REPORT of the Department of Agriculture for the year ended 31st March, 1919, with Appendices.

Presented to both Houses of Parliament by Command of His Royal Highness the Governor-General.

THE MINISTER OF AGRICULTURE.

I have the honour to submit my report on the work undertaken under Vote 30—Department of Agriculture for the year ending 31st March, 1919.

Although the administrative and educational branches of the work of the Department are provided for in two separate Votes, and separate reports on them are issued, they are so closely inter-related that the distribution of work between them often resolves itself into a matter of expediency, and in order to obtain a correct idea of the aims and activities of the Department as a whole the two reports should be read conjointly.

As this is the last report I shall have the honour to present, though it is possible I may be responsible for the conduct of the Department for another year, I shall take the liberty of occasionally referring to events that have occurred after the end of the year reviewed in it and also to work performed previous to it, and to reiterate certain suggestions made in previous reports, but not yet given effect to, which I believe to be essential to the welfare of the great industry served by the Department. The delay in the issue of the report, for which I am sorry, has been caused by pressure of work and the desire, which I fear may after all be but imperfectly realised, of making it as complete and comprehensive as possible.

Owing to the situation created by the war, which instead of becoming easier since the termination of hostilities has in some respects become more complicated and troublesome, and besides impeding the work of the Department has imposed additional duties upon it, and to the growing demands of the agricultural community, and the shortage of staff caused by circumstances unconnected with the war, but coinciding with it, and last but not least to the Influenza Epidemic which affected the country in an appalling way, the life of the Department during the past year, as during the years immediately proceeding it, has been an anxious and strenuous one. Expansions and new developments to any extent were naturally not possible though in certain directions advances were made, and many things were not attended to as they ought to have been and others—important in their way though perhaps not quite so pressing—were neglected altogether, but I am thankful to say what may be termed the normal work of the Department was kept going and the extra duties put upon it discharged without any great reverses or sacrifice of advances that had been made, or serious inconvenience to the public. The Department was also able to help the farmers to avail themselves of the exceptional openings created by the war of disposing of produce which they were in the habit of exporting, and of obtaining a footing on the markets oversea for new products, by instructing them in the preparation of it for market, and by grading it.

ACCOUNTS.

The actual Receipts and Expenditure for the past two years were as follows:—

	1917–18.		1918–19.	
	Expenditure.	Revenue.	Expenditure.	Revenue.
	£	£	£	£
Administrative and General ...	35,691	206	38,993	565
Veterinary	98,310	2,527	123,515	2,160
Sheep Division	164,444	96	185,941	370
Veterinary Research	61,100	25,995	67,369	27,285
Dairy Industry	4,825	—	5,205	—
Botany	36,776	—	39,523	418
Tobacco and Cotton	8,337	880	9,395	937
Horticulture	2,664	134	3,512	63
Viticulture	3,829	2,449	4,361	4,544
Entomology	22,654	376	13,701	169
Chemistry	2,854	65	3,467	41
Publications and Library	1,950	—	2,711	—
Co-operation	4,218	—	3,999	—
Dry-Land Farming	3,039	1,012	2,872	368
Guano Islands	44,424	81,544	54,081	101,607
Grain Inspection...	4,891	7,886	6,847	6,145
Miscellaneous	—	1,748	—	1,847
	£500,006	£124,918	£565,492	£146,519

The increase of £65,486 in the gross expenditure and of £43,895 in the net expenditure of the Department over that of the previous year were due to slight increases in the professional and technical staff rendered possible by the termination of the war, but more particularly to the return of officers from active service, and increases in war bonuses and in the cost of supplies and equipment of all kinds, and to the contribution of £10,000 towards the cost of the measures for the prevention of the spread of Rinderpest from the late German S.E. Africa—where it had become rampant during the campaign in that territory—southwards to the Union.

With the exception of the amount referred to, which is included in the expenses of the Veterinary Division, and of an honorarium of £3,000 to Sir Arnold Theiler for the long and distinguished services rendered by him in the investigation of diseases of livestock, granted on the eve of his presumed retirement which happily has been postponed, and the £30,029 spent on the eradication of citrus canker which is shown in the accounts of the Division of Botany, and the reduction of the expenditure of the Division of Entomology on the destruction of locusts owing to the comparative freedom of the Union from that pest throughout the year, there was nothing new or novel in the accounts.

If the expenditure on Scab and East Coast Fever—which are as running sores—and on citrus canker—which it is hoped will soon cease through the extermination of it—that amounted to not less than £300,500, is deducted from the total expenditure, the cost of the whole of the remaining activities of the Department amounted to £264,992, or if the revenue be subtracted to £118,473.

I am thankful to say that the recovery and adjustment—for some unfortunately had to be written off—of the money advanced to farmers of the various Colonies before the Union in the shape of loans, livestock, steam ploughs, etc., which amounted to a very large sum and occasioned an immense amount of work and worry, is now practically completed.

With the exception of grants-in-aid to certain central agricultural and kindred societies in the Union and to similar societies in Natal and O.F.S., amounting to £5,293—included under the heading "Administration and General"—a list of which appears in the appendices to the report, no direct financial assistance of any kind was made to farmers and the whole of the money placed at the disposal of the Department was devoted to work of a fundamental character such as protecting livestock and crops from disease, and investigations for the advancement of agriculture, and educating and organising the farmers.

Whatever loans were made to farmers by the Government were made through the Land Bank. That Institution, which was created in the Transvaal and after Union extended to the whole country, has proved of immense assistance to farmers and has relieved the Department of much delicate and invidious work, and it is to be hoped that in future whatever financial assistance is required by farmers either in the nature of loans for development, or for relief in emergencies caused by untoward circumstances such as from time to time are bound to occur, will be made through the agency of it, as it is a competent and impartial authority and as far removed from political influences as it is possible for a State Institution to be.

The expenditure and receipts of the Department since Union are as follows:—

	Expenditure.	Revenue.	Net Expenditure.
	£	£	£
10 months ending 31.3.11	596,810	*	—
1911–12	564,578	115,904	448,674
1912–13	468,700	95,679	373,021
1913–14	467,018	119,472	347,546
1914–15	394,633	62,116	332,517
1915–16	382,945	106,279	276,666
1916–17	397,564	86,196	311,368
1917–18	500,006	124,918	475,088
1918–19	565,492	146,519	418,973

* Revenue for ten months ending 31.3.11 not available.

After Union considerable savings were effected in the clerical work of the four Colonial Departments, but with the exception of the Transvaal Department the provision for scientific and technical work in the whole of the Colonial Departments was inadequate, and increases were necessary in connection with it.

When the war broke out in 1914 the expenditure was immediately reduced to the lowest limits consistent with maintaining the most essential work of the Department. The action was justified, but none the less regrettable as the development of the Department which was just feeling its feet was seriously retarded and as soon as the outlook brightened the Vote was increased to meet the more pressing needs, and if the country is to be served as it ought to be, further increases will be necessary as practically every division is still below strength and certain branches of work lying outside their scope are inadequately provided for.

In the forthcoming estimates provision will be made for a number of new posts and for slight increases in the expenditure of most of the divisions and considerable ones for the investigation of Gal-lamziekte and the eradication of Citrus Canker.

BUILDINGS.

Owing to difficulties occasioned by the war the building programme was restricted, but the equipment of Armoedsvlakte as an experiment station for the investigation of Gal-lamziekte was proceeded with, and also the erection of three houses for the staff and certain other works, notably a new electric light and power plant and boiler house and extensions to the Railway Siding at Onderstepoort, and a commencement was made with the building of laboratories for the Division of Chemistry on a site near to the Botanical laboratories, and with an up-to-date and commodious greenhouse for infection experiments for the Division of Botany, both of which were greatly wanted.

A fireproof building for the accommodation of the herbarium and some additional laboratories are urgently needed by the Division of Botany, and it is hoped that as originally proposed a building will soon be erected for the adminstrative staff of the Department and such Divisions as do not require laboratories, on the site reserved for it above the Botanical Laboratories, and also laboratories for the Division of Entomology on a site near to the new Chemical Laboratories.

Besides benefiting the Department the erection of these buildings would release offices in the Union Buildings that are required by other Departments and also two good dwelling houses that would be most useful at this juncture for residential purposes.

The Department will benefit enormously by the reversion of the portions of ground known as Donkey Camp and Prinshof to the Government through the rejection of them by the Council of the Transvaal University College as a site for the new Agricultural College, which I then thought and still venture to think was a sad mistake. These grounds adjoin the grounds of the Union Buildings on one side and the Zoological Gardens on the other, and will provide the Department with an excellent experiment station some 300 acres in extent, situated just below the existing laboratories and the sites suggested for the new ones, which is the one thing needed to complete the equipment of the Department in Pretoria and for which, as a matter of fact, Prinshof was originally procured. The remainder of the ground and the portions of the grounds of Union Buildings adjoining it will furnish magnificent sites for any Departmental or other buildings that may be required in years to come and for the extension of the collection of trees and shrubs and otherplants that constitute such a pleasing and instructive feature of the grounds surrounding Union Buildings. If the buildings referred to are erected on the sites suggested the Department will then be housed in a series of buildings with sufficient space around them to permit of any extensions that may be necessary and of any outdoor work needed by the Scientific Divisions, on healthy and beautiful sites in close touch with each other and with the Union Buildings and the Experiment Station, and in a manner which as regards facilities for work and the convenience of the public and opportunities for expansion could not well be improved upon.

Further if the grounds are properly laid out, as they can easily be at a moderate cost by the native convicts after they have completed the lay-out and approaches to Union Buildings, they will increase the beauty of the setting of that noble pile and add greatly to the amenities of the town.

STAFF.

With deep regret I have to record the deaths during the year of 28 officers, most of whom died from influenza contracted in the severe epidemic experienced towards the end of the year 1918. Many officers of the Department rendered valuable assistance in the alleviation of suffering during that grievous time, and some of them contracted the disease whilst ministering to others and died of it. Separate tribute to these officers will be paid in the notes on the Divisions which they served.

During the year Mr. J. Walker, Assistant Director of Veterinary Research, was transferred to the British East African Administration; Mr. S. H. Skaife, Assistant Entomologist, Cape, was appointed lecturer in Entomology at the School of Agriculture, Cedara.

Sir Arnold Theiler, after a short absence on leave which was intended to precede retirement from the Service, kindly undertook to assist the Department by taking charge of the Lamziekte investigations at Armoedsvlakte, which as stated elsewhere, were attended with most important results.

Mr. I. Tribolet, Lecturer in Horticulture at Elsenburg, was appointed Chief of the Division of Horticulture in place of Mr. R. A. Davis resigned, and Mr. J. du P. Oosthuizen, Expert in charge of Tobacco work in the Orange Free State, was appointed Assistant Chief of the Tobacco and Cotton Division, and Mr. R. T. Falgate, Manager of the Piet Retief Experiment Station, was appointed Itinerant Cotton and Tobacco Instructor in Natal.

Twenty temporary officers were employed during the year on the Locust Campaign compared with 151 in the previous year, 20 temporary officers were engaged on Citrus Canker eradication work, and 9 additional sheep inspectors and 4 additional stock inspectors were appointed.

Mr. P. J. du Toit, Under Secretary of the Department, continued to serve on the Public Service Commission through the year, and Mr. B. G. L. Enslin was detached for duty as Chairman of the Central Wool Committee, and Mr. R. J. Bulmer, Fruit Inspector, was granted leave for a period of two months to undertake work in the Belgian Congo, and Mr. G. N. Williams, Chief Clerk, whose absence was also severely felt, remained away on military duties.

Since the outbreak of war in 1914, 254 officers of the Department have been absent on military service in the Rebellion, in the campaign in South-West Africa, in East Africa and in Europe, and of these 12, I regret to say, gave their lives, and 15 were wounded, gassed or suffered from shell shock. Many of our officers gained credit for meritorious service, nine D.S.O.'s, three O.B.E.'s, and five M.C.'s being awarded to them, whilst 10 others were mentioned in despatches. During the year many officers returned and at the end of it only 34 were away. Now the war is over I desire to record my appreciation of the action of the men who volunteered for military service; and also to pay tribute to those, who, unfit for service and left behind, struggled under the arduous conditions of additional duties and insufficient staff, to keep things going until the return of their comrades. Few but those directly concerned with the Department can realise the strain imposed upon it since the outbreak of war, and previous to that by the reorganisation of the Department after Union—a most difficult and delicate task which was barely completed when the war broke out—and I cannot speak too highly of the way the staff have behaved throughout the whole of these particularly trying periods.

Provision is being made on the Estimates for 38 new posts and when they are filled and the students now away return, there will be, approximately, 300 fully qualified administrative professional and technical officers in the two branches of the Department, compared with 150 at Union and 30 in 1898—the year before the South African war—all of whom it may be remarked in passing have far better facilities for doing justice to their work and to themselves than had their predecessors.

In addition to the above there are also a number of officers engaged either directly or indirectly in educating and advising the farmers and in developing the resources of the soil in the Irrigation and Forestry and other Departments and in the Faculties of Agriculture at the Universities, all of which are comparatively new creations.

Since Union the staffing of the Department has been a source of continuous and intense trouble and anxiety, but I am thankful to say the clouds seem to be breaking. Before Union, with the exception of the Transvaal, which was formed on a professional basis to begin with and was fairly equipped with scientific and technical officers, the number of such officers in the Agricultural Departments of the various Colonies was small, consequently the Department was inadequately supplied with them at the outset and though strenuous efforts were made to obtain more, and a great many were got, as is shown by the doubling of the staff since Union, yet a combination of circumstances such as is unlikely to occur again rendered it impossible to get enough to overtake the initial deficit and meet the growing demands of the Department.

The primary cause of the trouble was the lowness of salaries fixed for the majority of the scientific and technical officers at Union, which were based upon those prevailing in the Colonies paying least in preference to those paid in the Transvaal, which were deemed excessive. Not only were the salaries decided upon low at the time, but they have proved increasingly insufficient owing to the growing demand for experts the world over and the opportunities of earning money in other ways, and the rise in the cost of living, and they resulted in many valuable officers leaving the Department for more remunerative positions elsewhere, and made it very difficult to obtain others.

The emphasis laid on proficiency in both official languages in accordance with the Act of Union, though natural and correct, added enormously to the difficulties of the situation, owing to the limited number of persons with a knowledge of both who were competent and available for service in the Department.

The war abstracted many men from the Department and rendered it impossible to obtain others to act for them in their absence, or to fill new posts, and suspended the training of young men for positions in the Department, and finally the newly constituted Faculties of Agriculture at the Universities added to our embarrassment by selecting their staffs almost entirely from officers of the Department, at a time when they could ill be spared.

Happily the war is over and the Faculties of Agriculture at the Universities have pretty well completed their establishments, so the great drains upon the Department have ceased; further the salaries attached to certain posts have been raised and allowances have been granted to meet the increased cost of living and there are good reasons for believing that as the result of the Commission now sitting and the attention that has been drawn to the subject, the salaries of the remainder of the officers will be adjusted on a scale more in accordance with the value of their services.

The prospect of obtaining officers from this country is also improving. But a short time ago practically the whole of the effective force of the Department of Agriculture consisted of imported officials and there were no opportunities of training young men for the Department in the country, but lately great and welcome changes have occurred.

The system inaugurated in the Transvaal before Union of awarding scholarships to promising young persons to proceed abroad to qualify for posts in the Department at leading Universities or wherever the best training for the work they had in view could be obtained, which was suspended by the war, is being resumed and extended in order to make up for lost time, and a number of young men have also proceeded abroad to study agriculture and the sciences related to it on their own account, and when they and the students now away return, there will be something like 100 fully qualified young South Africans in the Department and in the Faculties of Agriculture at the Universities.

Great strides have also been made in the study and teaching of science at the Universities, and the grounding in pure science necessary for the training of specialists can now be obtained at them, whilst facilities for serving the apprenticeships needed for many of the technical posts, and also for obtaining an insight in the application of the various sciences to agriculture and for post-graduate work are available at the Schools of Agriculture and Experiment Stations, and in the laboratories of the various Divisions of the Department.

The College of Veterinary Science which is being started at Onderstepoort marks a great advance and will, it is hoped, be followed by colleges for the study of Dairying and Horticulture, both subjects of vast importance to the country and needing facilities better than those now existing, both for research and for education.

But though the employment of young South Africans in the Department is wholeheartedly to be encouraged, it would be a grievous mistake ever to entirely close the door to persons outside; the country owes much to officers from oversea who have identified themselves with its interests, and many of the problems connected with the development of the resources of the soil of the country are of so profound a character that the investigation of them can only be undertaken with any hope of success by the most powerful and highly trained intellects, and in view of the importance of them to the country and of the stimulating effects of men brought up in different schools of thought it is imperative that the very best men obtainable should be got wherever they are to be found and that we should follow the advice of Dr. Johnson and welcome any one who can teach us anything we do not know.

It is also hoped that despite the advances made for the training of young men in this country for posts in the Department, provision will continue to be made for post-graduate and study leave abroad, in order that the Department may be kept thoroughly informed of what is being done elsewhere and its officers refreshed by contact with the masters of their subjects, as it is imperative that the persons who have to act as advisers to the greatest industry in the country should be as well qualified and as up-to-date as it is possible for them to be, for the issues at stake are enormous.

Owing to a combination of favourable circumstances supplemented by the efforts of this and other Government Departments, the farming industry has progressed wonderfully of late and the number of persons engaged in farming and the amount of capital invested in it are infinitely greater that they were and the duties devolving upon the Department in the way of protecting livestock and crops from disease and in educating, advising and organising the farmers and assisting them to obtain markets for their products are likewise infinitely more numerous, varied and onerous than formerly. Further, farmers are consulting the Department more freely and are relying more and more upon it for protection, information and other assistance, which in the interests of all concerned ought to be forthcoming, inasmuch as a little timely advice and encouragement from one competent to give it may make all the difference between success and failure. Moreover, as I have endeavoured to make clear in my covering minute on Agricultural Education, farming in this country is entering upon an entirely new era. Hitherto, owing to the genial climate, the abundance and cheapness of native labour, the ease with which crops could be grown and stock kept on the virgin veld, the scanty European population, and a succession of events, commencing with the establishment of the mining industry and culminating in the late war, which created excellent markets for produce and rendered money plentiful to the European population, and easily obtained by farming and in other ways, farmers in South Africa, though they had their difficulties to contend with, which, as a matter of fact, were concerned more with the occupation of the country than with farming proper, have in many respects been exceptionally favoured. It may be that other events will occur to continue and possibly increase the flow of capital into the country, and the circulation of money in it, and it is hoped they will, but as the local markets are now fully supplied with such products as can be successfully grown here, it is obvious that unless they speedily increase, our sole hope of maintaining the position we have gained during the war, to say nothing of expanding, will be by exporting not only certain of our products as in the past, but the surplus of the whole of them; if the high prices and keen demand for foodstuffs and other raw materials caused by the war continue the readjustments may be effected without serious inconvenience, but if they fall, as is likely because of the reduction in the purchasing power of the great European nations which before the war were the chief buyers of products such as we shall have to dispose of, the country may have to face an ordeal the like of which it has not yet experienced.

Thanks to the prosperity enjoyed of recent years and the immense sums of money that have flowed into the country during the war and to the progress made by the farmers, particularly the more enterprising ones, and by the Government in formulating and carrying out schemes for their benefit, the farming industry is infinitely better able to cope with the situation now than it would have been had it occurred earlier and the Government to assist it, and the country is also possessed of many and great advantages: its geographical position is favourable for trade and though its climate has its drawbacks yet on the whole it is favourable for farming, and—what is perhaps its greatest asset—the climate and the soils combined lend themselves to the production of a wide range of products of outstanding quality. Further, though native labour is dearer than it was and harder to obtain owing to the more liberal use of it by the farming and other industries, South Africa is far better situated in respect of labour than any new country in the world farmed by Europeans (except possibly tropical ones which do not compete with us and, therefore, do no concern us), for in them the whole of the work on the farms and in the farm houses has to be done by the farmers and their families and such hired labour as can be obtained and which has recently demanded as much as £2 per day for harvest and 2s. 11d. per hour throughout the summer months.

Under no circumstances, however, would it be easy for farmers brought up as the majority of ours have been to compete, in falling markets, with farmers from other countries who have been braced and trained by rigorous climates and scarcity of labour and relentless competition and whose Governments have stores of knowledge and elaborate organisations to assist them, and it will be particularly hard at this juncture, when the change from easy-going extensive farming to more settled and intensive farming—always a trying period in the history of a nation—is in progress, and when the costs of production, which despite the immense advantage enjoyed in respect of native labour—and, perhaps, partly in consequence of it and of the other good things which Providence has bestowed upon us—are high compared with other countries, and may be expected to mount still higher owing to rising wages and the necessity for the amelioration of the soil, and the obligation of equipping the farms and of farming them on more up-to-date lines, and last and by far the most serious of all, when the soils of the country—originally by no means rich in reserves of plant food—have become so impoverished by continuous cropping without regard to the maintenance of their fertility, that the yields of our staple crops have become the lowest of any country of any agricultural pretensions in the world, and according to the last census are decreasing, and the veld has been seriously damaged and its carrying capacity reduced by reckless grazing and burning.

In view of the extreme gravity and urgency of the situation every possible means should be employed to relieve it, and for this reason it is imperative that the Department should be developed to the fullest extent, for naturally a well-organized and well-founded Department of Agriculture is the most potent agent that can be employed by the State for that purpose. Now we have become an exporting country protective duties and subsidies will be of no avail and increased production and reduced costs alone can help us. Although great advances have been made of late in the application of science to agriculture and in the practice of farming, yet owing to the recent settlement of this and other warm semi-arid portions of the globe like it, our knowledge of it from a farming point of view is still meagre and, as I have tried to show in my covering report on Agricultural Education, more officers are urgently needed to conduct investigations with the object of discovering ways of overcoming obstacles and of utilizing the assets bestowed upon us by nature and generally of blazing the path of progress, and also to educate and advise all sections of the farming community. The settlers upon whom money is being spent so freely and from whom so much is hoped are greatly in need of advice and many of the older generation of farmers, upon whom the changes will for various reasons press particularly heavily, will also want help or they will inevitably fall by the way.

More officers are also needed to supervise and co-ordinate the work of the Department as a whole and to undertake duties not falling within the scope of any of the Divisions and to keep in touch with the farmers and survey the wants of the country as a whole in order to make sure that the resources of the Department are disposed of to the best advantage and that no particularly pressing or promising work escapes attention.

Before Union there were four Ministers of Agriculture and four permanent Heads, all of whom, with the exception of those in Cape Colony, were located in the centres of the various Colonies and, therefore, able to quickly reach any part of them, and for the same reason were readily accessible to the public. After Union there was one Minister, one Secretary and one Under Secretary, though subsequently a second Under Secretary was appointed. The reduction in the number of Ministers and of Senior Administrative Officers, which would have been severely felt under any circumstances, was greatly accentuated, and the Department severely handicapped in other directions by the separation of Parliament from the seat of Government. Besides the cost of bringing officers to Cape Town from Pretoria and keeping them there for varying periods during the session, and of exchanging views and papers between the two centres, which considerable as it is, is really the least of the evils involved, and the waste caused by the Secretary at one end and the Under Secretary at the other being mainly occupied in corresponding with one another, the arrangement adopted almost divorces the Minister and Secretary from the Department, for if to the six months usually spent in Cape Town be added the customary six weeks' leave, and the time occupied in travelling about the country, only from three to four months remain for the Department in Pretoria and under such circumstances it is impossible for them to familiarize themselves with its officers and its work and to supervise and influence it to the extent they ought to do. Owing to Cape Town being situated in an extreme corner of the Union it is impossible for the Minister or the Secretary to make short trips into the country during the session as they would be able to do were Parliament more centrally situated and it is likewise difficult for farmers to get to them during that time, a matter of no small importance, particularly in this country where the people have been accustomed to close personal intercourse with those in authority over them, and are not used to a Government so largely occupied with Parliamentary affairs as the Union Government has been since Union. Further, under the existing arrangement, Members of Parliament only come in contact with the Department indirectly and consequently have no opportunity of becoming acquainted with its chief officers or familiarising themselves with its work, which I am convinced is responsible for many of the erroneous views held regarding it.

But even if a single capital situated in a more central position were selected, it is doubtful whether one Minister would be sufficient to attend to this vast country and to deal with a community which as stated above have been in the habit of seeing so much of their rulers, and I venture to suggest the appointment of a Parliamentary Under-study and an additional Under Secretary. At Union I recommended that there should be three Under Secretaries, one for Agricultural Education, one for the administration of the Department and one to act as liaison officer between the Department and the country, and I am now more convinced than ever that there is great need both for the Parliamentary Under-study and for the additional Under Secretary. The appointments suggested would not entail any great expense and as finishing touches frequently do they would confer benefits out of all proportion to it, for they would assist the country enormously.

In the evidence submitted to the Public Service Commission of Inquiry I emphasized the necessity for placing the salaries of officers of the Department upon a more equitable basis and also for making arrangements whereby the salaries of the scientific and technical officers of the Department could be revised as occasion required. Owing to the diversity of the work devolving upon the Department and in the qualifications of the officers required to undertake it the experts in the Department cannot be graded with the same completeness that clerical officers can, and also that the salaries of such officers are and must be largely determined by the salaries or incomes enjoyed by men of similar qualifications outside the Department and which they could command were they to leave it, and which are continually fluctuating in accordance with the supply and demand.

I also urged the extension of the powers of the Public Service Commission and the strengthening of it, and that the Commissioner or the Chairman of the Commission, if it consisted of more than one member, should be a Judge of the Supreme Court who, in addition to a legal training and a well-balanced mind such as would naturally be possessed by a judge, should be a man of breadth of view, and be imbued with a genuine interest in the efficiency and welfare of the service. In the event of a single Commissioner being appointed—for which there is a good deal to be said, as it would, probably, make for thoroughness and despatch, he should be assisted by three assessors or inspectors as they call them in Australia, representing education and philosophy, natural science, and the service. If more than one Commissioner is appointed the Commission should be extended to include the Chairman as aforesaid and members to represent each of the subjects mentioned.

The Macdonnell Commission in England laid stress upon the body appointed to deal with the service including men of wide knowledge both of school and university education, of sympathy with academic studies and of official experience. It did not specifically mention natural science, but in view of the importance of science to many Departments of State and particularly to this Department, I urged the inclusion of a representative of it.

I recommended a Commission on the Australian system in preference to a special branch of the Treasury as suggested by the Macdonnell Commission, on the grounds that a Commission directly responsible to Parliament would be less susceptible to political influence than a section of a Ministerial Department and that if it published an account of its actions and the reasons for them as it ought to do, more publicity would be given to its proceedings, which is a matter of great importance as far as the Service is concerned. A Commission would also enjoy more freedom of action than a Government Department and be able to become better acquainted with the service and its requirements and to go into matters more fully and deal with them more promptly than a sub-division of the Treasury, could, and, rightly or wrongly, it would be regarded by the service as more impartial than a branch of the Treasury and so command greater confidence. It would also be of great assistance to Heads of Departments, for a Commission that commanded the confidence of the Service would be able to appoint officers and to help to get the right men in the right places and to reward merit and punish incompetency and indifference in a way a Head of a Department frequently cannot do, or finds great difficulty in doing no matter how desirable it may be, owing to the suspicion with which his actions are apt to be regarded.

If the efficiency of a Department and its value to the public are to be maintained, it is essential that the very best men available for the different kinds of work should be obtained and they should be disposed of to the best advantage and encouraged to keep up to date and alert and not allowed to remain in posts they have ceased to do justice to. The selection of the right type of officer in the first instance and the disposal of officers in the service in accordance with their fitness for the various kinds of work is important to all Departments and it is particularly so in Departments like this in which the work is highly specialized. It is also essential that officers who are engaged in administration, research, and teaching should be up to date and full of vitality and courage and driving power. Men naturally become duller and slower as they get older and tend to lose their vision and creative powers. According to psychologists, men cease to be receptive to new ideas after 40 and women somewhat earlier. It will therefore be seen that youth is or should be a great factor in a Department like this just as it is in big businesses in America. If a clerk becomes dull and slow the worst that happens is that he does not do quite so much work in the day as he used to do, but if a research officer loses his initiative and energy, or is employed upon work which has become distasteful to him with consequent loss of zest, the position is far more serious, for not only is such an officer usually highly paid but if he is maintained in his position he keeps another man out and the work he was appointed to perform, which may be of the greatest importance to the country, is done very imperfectly or perhaps not at all.

The above remarks apply to Heads of Departments perhaps more forcibly than to other officers because by virtue of their positions more depends upon them. Heads of Departments should be old enough to have acquired the necessary experience but not, to quote the recent words of a distinguished stateman, old enough to have lost "vigour and vision" nor should they be too long in office.

As the Australian Commissioner rightly remarks the place of a Head of a Department is by the side of his Minister, and when the time occupied in attendance on his Minister during the sitting of Parliament and during the remainder of the year and in attending to departmental details, which, no matter how well a department is organized and staffed, are bound to find their way to him, is deducted, little time is left for getting about the country and reading and reflection.

Heads of Departments therefore have to rely mainly upon the knowledge of their subject and of the country acquired before their appointment, and if they remain too long in office it is almost impossible for them to avoid becoming stale and out of date. Personally I think about 10 years is the ideal term of office for a Head of a Department. That would give him sufficient time to take stock of the situation and give effect to his ideas and not enough to become slow and hidebound.

In a lecture on The Public Service in War and Peace recently delivered by Sir Wm. Beveridge he also advocates young Heads of Departments and quotes with approval a business man of great experience in Government work to the effect that no man would ever be capable of a really first rate position if he had not had responsible work before he was thirty, and he goes on to say that the average period of service in Government Departments needs to be shortened so as to reduce the age of those who are at work and in charge and to advocate that public servants in important positions should be encouraged to retire soon after 50 in the same way that successful business men begin to drop out of their business about that age as their sons and partners come along, rather than be compelled to remain on till they are 60 or 65.

In addition to the changes occurring in individuals, the volume and character of the work devolving upon a Department of Agriculture constantly varies in accordance with changes in the farming industry and in other factors affecting it. As previously stated, if the efficiency of the Department and its value to the public are to be maintained, it is essential that the very best men available for the different kinds of work be procured and that they be encouraged to keep alert and up to date and not allowed to remain in any post in which they are not required or which they are unable to do justice to. To do this officers must be afforded facilities for familiarising themselves with what is taking place in other parts of the world, initiative must be encouraged and merit rewarded and sloth and indifference penalized and redundant or incompetent officers removed, and a considerable portion of the Department must be as mobile and as readily marshalled as an army in the field.

In private undertakings the achievement of these objects is not difficult or at all events is dependent upon the capacity of the directors, but in Government Service it is very different. For reasons which need not be discussed here Government Service is apt to generate inertia and exercise a deadening influence on officers, and its processes are slow and cumbersome and sometimes very disheartening, but what is a still greater obstacle is the distrust attached to the actions of Heads of Departments in connection with staff matters. If a Head of a Department recommends the transfer or retirement of an officer, or withholds an increment, or promotes an officer on account of merit instead of for seniority or endeavours to obtain special treatment for deserving officers, or departs in any way from the ordinary routine, no matter how right his action may be, it is almost certain to arouse a good deal of feeling in his Department, and possibly to be fiercely attacked in Parliament and by the public, and in any case Parliament is very apt to suspect and accuse Heads of Departments of partiality in dealing with staff affairs.

From all points of view it is imperative that steps should be taken to enable the Service to be managed in a more businesslike way than at present and to inspire confidence in the minds of officers in respect to the justice and expediency of any action taken and to relieve the strain upon Heads of Departments, which as previously stated is rapidly becoming intolerable. If this is not done the temptation for Heads of Departments to slacken in the thankless task of inaugurating reforms and keeping their Departments up to concert pitch will be irresistible. promotion will be allowed to proceed by seniority and the Service will deteriorate accordingly.

As far as I can see the Commission alone would be able to supply the want and to obtain the confidence of Parliament and the Service and assist Heads of Departments.

Besides the subjects mentioned there are several others that could be dealt with with advantage by the Commission, such as drafting and interpreting regulations and considering exceptional cases and making recommendations with respect to them, such as leave for special purposes, special allowances for subsistence, compensation for residence in unhealthy areas, allowances for motor and other transport, and acting allowances.

At present the Treasury deals with these matters and in the event of its ruling being unacceptable the Minister of the Department concerned has the alternative of discussing it in Cabinet. It is realized that the Treasury must have a voice in all expenditure and that the Cabinet as representing Parliament is the final court of appeal. But I feel convinced it would be a great advantage if staff matters such as those referred to could be fully considered by the Commission, in open court as it were, and both sides heard, before further action was taken. I think that if such a course were adopted justice would be more likely to be done and the Service would be better satisfied and a great deal of time would be saved.

VETERINARY DIVISION.

I regret to have to record the death from Influenza of Government Veterinary Officer Marais, one of the most promising of the younger Veterinary Surgeons, who contracted the disease whilst assisting to nurse sufferers from it in his area during the great epidemic. With this exception no changes occurred in the professional staff during the period under review.

In the course of the year several officers returned from active service but at the close of it, 10 were still engaged in military duties. The professional staff now numbers 49 which is 7 short of the establishment sanctioned by Parliament. Moreover several officers are approaching retiring age and others are unsettled and it is feared may resign unless their salaries are increased.

It is true that despite the absence of a number of the professional officers of the Division on active service no serious set-backs occurred but the risk was great and it and the strain imposed upon the officers who remained were such as would not for a moment have been justified under ordinary circumstances, and many things were necessarily left undone that ought to have been done.

Besides those required to deal with contagious diseases, more veterinary surgeons are wanted to assist farmers in case of accidents and non-contagious ailments of stock and to instruct them in veterinary hygiene.

Twenty years ago stock farming in South Africa with a few bright exceptions consisted of little more than nomadic grazing. The value of even the best animals was comparatively small and the export of animal products, consisting almost exclusively of wool and mohair and hides and skins and ostrich feathers, amounted only to £4,507,772 in 1898, whilst on the other hand in the same year meat, bacon and hams, butter, cheese, eggs and other animal foods were imported to the value of £1,112,961. Since that date almost revolutionary changes have taken place and an industry—many sided and of immense importance both to individuals and to the State—has been created. Livestock have multiplied in numbers and owing to large importations of high-class stock from abroad and improvements in animal husbandry they have increased enormously in quality and value. This may be judged by the fact that 68,689 pure bred animals have been registered in the South African Stud Book and £5,250 has been paid for a bull bred in this country as well as £1,500 on more than one occasion for rams similarly bred.

New branches of stock farming such as dairying, the curing of hams and bacon and the production of beef and of poultry and eggs for export have been established and last year the value of animal products exported amounted to no less than £14,354,039, whilst, despite the increase of population, the value of food stuffs of animal origin imported for consumption in South Africa, consisting mostly of condensed milk, which will soon be produced here, had diminished to £309,261.

The number of persons whose livelihood in whole or in part depends upon livestock is also much greater than it was, and the closer settlement of the country and the restriction of trekking and other causes whilst reducing the risk of contracting diseases also make it harder for farmers to evade endemic and seasonal diseases by moving their animals. At the same time on account of the greater value of the animals and their significance to the smaller farmer, losses of livestock are far more severely felt now than they were a few years ago.

Thanks to the brilliant investigations of the Research Division, the risk of mortality of stock from native diseases has been greatly reduced, and much more is known about them, but though this risk has been lessened and farming is not attended with the uncertainty that hitherto accompanied it, the losses from disease are still appallingly high. According to the census no less than 89,372 horses and mules, 219,227 cattle and 2,921,696 sheep and goats and 56,658 pigs died of disease last year. As mentioned in my last report, in Canada and Australia, countries that are not nearly as troubled with disease as this is, there is one veterinary surgeon to every £250,000 worth of livestock, on which basis the Union should have 400, whereas at present there are but 68 veterinary surgeons in Government service and 35 in private practice.

A gratifying feature of the situation is that whereas formerly veterinary surgeons were regarded with suspicion if not aversion by farmers, farmers are now pressing for them and offering to pay for their services and at almost every gathering of farmers resolutions are passed to that effect.

As mentioned in previous reports, before the war veterinary surgeons were becoming scarce and hard to get owing to the diminution in the number of men qualifying for the profession and the low salaries paid by the Government. Owing to the war the first of these factors has been much accentuated, and moreover many trained and qualified men have died or become incapacitated, and the supply has been still further reduced.

In view of the urgency of the situation the problem of obtaining more men merits the immediate and earnest attention of the Government. The first thing to be done in justice to the existing staff and as an incentive to young men to join the division is to make a material increase in the salaries which, as stated are entirely inadequate; the second is the establishment of a college for training young men in this country to become veterinary surgeons, a subject which I touched upon last year and am discussing further in another portion of the report.

During the year 1,519 outbreaks of contagious disease came under observation in the course of which 4,305 animals died or were destroyed and 190,767 incontacts were tested, inoculated or otherwise dealt with. 652 cattle (of which 156 were consigned to Rhodesia) and 177 horses, 290 sheep and 291 pigs and a few other animals were brought into the Union from oversea. 508 head of cattle were tested for tuberculosis upon arrival from oversea, 37 of which re-acted and were slaughtered. 1,995 prosecutions were instituted for contravening the Stock Diseases regulations and fines to the amount of £4,244 were imposed.

The steps taken to arrest the spread of Rinderpest from German East Africa, where it was rampant, by inoculating cattle in that country in pursuance of the policy of meeting one's enemy at the gate, have proved successful, and the work of the Commission appointed for that purpose has been concluded.

The country has been entirely free from Lungsickness, a disease which was formerly a great scourge, though there now occurs a disquieting outbreak of it in the Bechuanaland Protectorate. It would have been fully justifiable to render the assistance suggested by the Principal Veterinary Officer could the men have been spared.

Foot and Mouth disease, which causes great loss in Europe and elsewhere and is justly dreaded, has not been known in this country for many years, while glanders, epizootic lymphangitis and mange have been reduced to very small dimensions, and in fact are on the way to being exterminated.

Little progress has been made during the year in respect to tuberculosis and no definite policy for dealing with it within the country has yet been adopted. Now the war is over the station at Pirbright in England, which was established by the Board of Agriculture there at the suggestion of this Government proffered in accordance with urgent requests for the same from the Agricultural Unions and Breed Societies, will shortly be available for the testing of cattle and as soon as it is all bovines intended for this country will have to be tested at it in accordance with the Stock Diseases Act No. 25 of 1916 and those that pass be admitted to the Union without further test. It is feared difficulties may be experienced in the inauguration of the system, but it is sincerely hoped they will not prove insurmountable. Last year no less than 7·25 per cent. of the animals imported from the United Kingdom re-acted on arrival here though accompanied by certificates from Veterinary Surgeons testifying to their freedom from Tuberculosis before shipment, and when it is remembered that some of these animals cost as much as £1,000 a piece in Great Britain and were urgently required for stud purposes here, the loss incurred in the slaughter and replacement of them is obvious.

Anthrax is spreading and has resulted in heavy losses in some districts. The disease, which is widespread, is particularly prevalent in tropical and sub-tropical countries; and it is most difficult to deal with here by reason of deaths from it being frequently attributed to other maladies such as galziekte, lamziekte and geelziekte, and the neglect of farmers to report the deaths of animals, and of their carelessness in the disposing of carcases. The disease is serious not only because of the risk it creates to human life and the heavy toll it takes on animals but because of the trouble it may make in the export of wool and hides and other products. There is hope that the next generation of farmers, many of whom are being educated at the various Schools of Agriculture, will have a better conception of the common rules of Veterinary Hygiene, the observance of which would mean so much in the control of this and similar diseases.

Contagious Abortion has been more prevalent or more generally recognised, which, it is hard to say. It was scheduled as a notifiable contagious disease, but on account of the difficulty of dealing with it, and the unfairness of the penalty of restrictions falling only upon the owner honest enough to report it while infection is almost widespread, it is being removed from the list. Attempts are being made to obtain a method of immunisation by inoculation.

Swine Fever is confined to narrow limits in the Cape Province. Judging from its effects in Europe and America it is liable to become a great danger to the industry and every effort is being made to stamp it out.

The position in respect to East Coast Fever is disquieting. In the Cape Province good progress has been made, and in the Transkei, owing to the good work of the Native Council, considerable headway has also been made, but in Natal and in the infected areas of the Transvaal the position is far from satisfactory. In the Zoutpansberg there has been heavy mortality and 500 cattle have died from it, and at Barberton there has been a serious set-back, while the outbreak at Pretoria is very grave. In Natal little if any progress has been made and the disease is still distributed throughout the Province. 73 fresh outbreaks occurred during the year and 83 in the year before and what is worse, many of these outbreaks occurred in parts which had for years been regarded as clean.

The causes of this state of affairs are many; omitting to report deaths, the treating of the disease lightly (except in occasional virulent outbreaks), the illicit movement of cattle, inefficient dipping and the neglect of it altogether being the chief of them.

The hampering of trade, the immense annual cost of roughly £70,000 to the Department and the extra duties imposed on the Police and Magisterial staffs and the loss to the country as a result of it, warrant more determined attempts than those hitherto made to stamp it out. The provision of additional veterinary officers, stock inspectors and magistrates, the earnest and constant assistance of administrative officers of all Departments concerned, extra transport facilities for the officers of the Division and methods of purchasing material for tanks and fencing without the delay consequent upon compliance with the present tender regulations would all help to check the spread of the disease, but without the cordial co-operation of the livestock community which at present in some cases is lacking the eradication of the disease will be impossible.

Though the possibility of finding a specific for East Coast Fever exists it is too uncertain for dependence to be placed upon it.

2·6 per cent. of the beef and 10·9 per cent. of the pork examined by the Veterinary Officer inspecting meat for export at Durban, were rejected for disease and unfit condition. 9·5 per cent. of the pigs slaughtered at this port for shipment were infected with measles, a proportion which is disconcertingly high. Only 0·3 per cent. of the cattle and 1·2 per cent. of the pig carcases inspected were tubercular, indicating that tuberculosis in South Africa in cattle kept under ranching conditions is not alarming.

34,303 head of slaughter cattle and 13,589 head of breeding cattle were introduced into the Union from neighbouring territories.

201,811 quarters of beef were exported against 279,085 quarters in the year before, the decrease being due, not to the falling off in the supply but to the shortage of freight; as evidence of which it may be recorded that at Durban of 16,992 carcases of pork passed for export, only 253 were shipped.

The meat exported as the reports show has given satisfaction, while the experimental consignments sent from the Cedara and Potchefstroom Schools of Agriculture and exhibited at the Liverpool and Smithfield markets, respectively, have been warmly praised. The best of the beef exported was good and the remainder was up to the specifications of the contracts, but there is little doubt that under normal conditions the quality of the bulk of our beef will have to be vastly improved before it will meet with a ready sale on the London Market, as it is still far below the class of beef sold there though it might be saleable on the Continent. Farmers will have to realise that only well bred and well fed young animals will meet the requirements of the trade and that cows and bulls and old trek oxen are not suitable. More thorough and systematic steps to encourage and supervise the export of meat are urgently required, otherwise the interests of this young trade from which so much is hoped will suffer. So far the inspection of the meat has been confined to rejection of such as was considered unfit for food or otherwise not up to the conditions of the military contracts. It was a great pity that the Commission it was proposed to send in 1917 to Australia, New Zealand and the Argentine to inquire into the production and export of meat was abandoned and it is hoped that as soon as a convenient opportunity presents itself the project will be revived or that other steps will be taken to ascertain what is done in the meat exporting countries and also what the customs and requirements of the European markets are.

It is also desirable that a sub-division of the Veterinary Division should be created under an officer who is thoroughly acquainted with the meat trade and the requirements of the oversea markets, to take charge of this important branch of its work, for until this is done it is to be feared the export of meat—which is naturally a subject of great moment inasmuch as above everything else we are a stock-farming country—will not be supervised and assisted as it ought to be.

The experiments conducted at the Potchefstroom and Cedara Schools of Agriculture and Experiment Stations have thrown much light upon the breeding, feeding and management of cattle for beef for export and should be carefully studied by all interested in the trade.

DIVISION OF SHEEP AND WOOL.

I much regret to have to report the loss by death through Influenza of two Sheep Experts, Messrs. Goddefroy and Wessels. Both were competent and enthusiastic officers, and well liked, and their loss in the prime of their lives will be severely felt.

The eradication of scab continues to monopolize the lion's share of the attention and expenditure of the Division, and during the year 433 Senior and Junior Inspectors were employed in dealing with this pest. I regret to say however that the statistics of the prevalence of scab indicate that the position at the end of the year was disappointing. During the early part of the year the efforts of the division were attended with considerable success, but the outbreak of Influenza towards the end of 1918 resulted in a suspension of dipping and a weakening of the supervision, with the result that the good work was undone. On December 31st, 1918, the condition in the provinces of the Cape, Natal and the Orange Free State was no better than twelve months previously, while in the Transvaal it was actually worse.

Contravention of the Scab Regulations is, I regret to say, still very common. During the year there were 1,692 convictions with an average fine of £3 2s. In this connection attention is directed to the remarks of the Chief of the Division on the inequality of the fines imposed.

1,527 new tanks were erected and there are now 40,743 in the country. It may be mentioned that the Division supplies plans and specifications of the kind of tank recommended. Increased attention was given to the development of a modification of the block system of dealing with scab advocated many years ago by Mr. Davison, Chief Inspector of Sheep in the Cape. Under it as soon as a reasonably sized portion of country becomes free from scab it is proclaimed a protected area and no sheep are allowed to enter this area except from another clean area, without being twice dipped under supervision. Efforts are then made to clean up the adjacent areas, which are dealt with as semi-protected until they become clean, when they are added to the protected areas. Already 45 areas in the best sheep districts of the Cape and 7 in the O.F.S. and 5 in the Transvaal have been declared protected; some of them are contiguous and others are isolated, but it is hoped that the greater portion of them will soon be linked up into a solid block which will be extended until it embraces the whole of the country.

Dipping materials were very difficult to obtain, and this militated considerably against the reduction in number of infected flocks. In those districts where the difficulty was most acute, efforts were made to provide relief by supplying dip to the farmers, with good results.

Some of the districts controlled by Inspectors are so large that during the trekking season, it is impossible for them to exercise the necessary supervision on movements of sheep and more inspectors are required.

In the best sheep districts a sounder public opinion is evident and farmers are taking pains to protect their flocks. To this extent the position is encouraging, but in other districts, where there are numbers of non-woolled sheep and where the population is largely a native one, little or no effort is made to eradicate the disease, and these districts remain a constant source of danger. Experience has shown that the dipping of sheep by farmers, though a simple operation, is often inefficiently carried out, and the result is disappointing and farmers become discouraged; and the only practical solution of this difficulty appears to be dipping under supervision.

The annual cost of the present method of controlling scab (and for the year under review nothing more than control has been achieved) and the losses occasioned by it are such as to warrant a determined effort to rid the country of this pest, once and for all. That one and a half per cent. of the sheep in the country should be infected with scab does not appear on the face of it alarming, but when the number of officers employed to eradicate it, who are really often only controlling it, and the harassing restrictions placed on the movements of sheep are considered, it becomes patent that more vigorous methods of attack should be employed.

Now the war is over and affairs are becoming more normal, renewed attention is being given to the eradication of scab, and some changes in the legislation affecting it are desirable. The Act passed after Union and the regulations formulated under it are good, but are susceptible of improvement and as a result of the experience and observations of the officers of the Division certain amendments both in the Act and the regulations have been proposed which it is intended to submit to a congress of sheep farmers at an early date.

It is interesting to record that as early as 1693 the celebrated Governor van der Stel took cognisance of the "heavy mortality experienced among the sheep . . . . caused mainly by scab because people have been negligent in segregating the scabby sheep from the healthy ones, so that in consequence of the sheep of one infecting those of another whole troops have died". In order to "rectify this carelessness" he issued two very stringent "placcaats" by which "the throats of every such sheep or all such sheep" might be cut and further contagion prevented; masters and servants failing in this or in reporting the disease were to be fined 25 rix dollars. In the course of time however these commands fell into desuetude and legislation was not again revived until 1874 when a permissive Act was passed in the Cape Colony.

Mr. Enslin has been engaged as Chairman on work of great service with the Central Wool Committee and when that is completed he contemplates a tour in Europe and America to inquire into the wool industry in those countries, and Mr. Michaelian, the Senior Sheep and Wool Expert will leave during the year on a short trip to Australia and New Zealand to see what is going on there and particularly to inquire into the export of mutton. During his stay he will also take the opportunity of purchasing a few selected stud sheep for the Government and for private individuals. Accompanying Mr. Michaelian will be five young South Africans, who have been granted scholarships for the study of sheep and wool as a result of the examination conducted at the conclusion of the special six months' course at Grootfontein. A student will also be sent to Bradford to study mohair, a departure for which the magnitude of the mohair industry furnishes ample justification.

There is a shortage of technical officers in many divisions of the Department but probably in none is the lack more keenly felt than in respect of Sheep and Wool. This understaffing is due in part to the recent rapid development of the industry by which our officers found more remunerative employment outside the Government Service, either as professional Sheep and Wool Experts in sheep classing, mating and similar work or as agents of large commercial or co-operative concerns connected with the wool industry, and in part to the effect of the war during which no students were trained oversea.

The special Courses in Sheep and Wool at the Grootfontein School of Agriculture have been of immense benefit and it is unfortunate that only about one-fourth of the applications could be accepted owing to the lack of accommodation. The officers of the Sheep Division in addition to assistance at these courses and long and short courses at the schools, have given 48 demonstrations in sheep classing and wool sorting and the making up of clips and some 420,000 sheep have been classed in various parts of the country.

Products exported from sheep during the year amounted to 15,242,881 lbs. of scoured wool, 100,391,617 lbs. of grease wool, and 25,284,318 lbs. of sheep skins, totalling in value £11,018,866, and from goats amounted to 19,645,684 lbs. of mohair, valued at £1,641,889, and 5,888,351 lbs. of goat skins, valued at £405,369, and the total increase in value of these products over that of the previous year amounted to £2,203,428, of which, approximately, £1.000,000 was due to the rise in the price of wool.

Marked progress was made in the sheep industry during the year. The stud and show sheep have now reached a very high standard and leading breeders are finding difficulty even in Australia in obtaining rams good enough for their requirements.

The export of the products of the sheep is still practically confined to wool and skins, but with improved management there should be a surplus of mutton available for export, and, as stated, Mr. Michaelian will inquire into the production and export of mutton and lamb in the course of his visit to Australasia.

The interest now being displayed in the formation of Co-operative Associations for the disposal of wool, and in the creation of companies and factories for the manufacture of woollen goods in South Africa is an encouraging sign of the progress made in the development of the country's resources.

The sale of wool to the Imperial Government was continued, but as stated in my last report, owing to freight being unexpectedly available to the United States and Japan, the necessity for assistance in the direction indicated was not so great as when the Imperial Government was first approached on the subject, and under the scheme, which was an optional one, only about one-fifth of the clip for the season 1st August, 1917, to 31st July, 1918, was disposed of.

The report of the Central Wool Committee dealing with the trade in Wool, Mohair, Skins and Hides in South Africa is an interesting yet indicting document, furnishing as it does evidences of practices both at the markets and elsewhere, which cannot but be condemned by all. The deliberate false packing of wool by some farmers tends to destroy the confidence of the oversea buyers in South African Wools, and the acting of brokers in the dual capacity of buyer and seller without disclosing that they are so doing is evidently open to abuse.

The recommendations of the Wool Committee regarding the making up of clips, marking of bales, purchase and sale of wool, skinning of animals and treatment of skins, classing of skins and hides and the organisation of sheep farmers are much to the point and ought to be familiar to every livestock farmer in the country, and it would be well if every farmers' association devoted its attention to bringing these recommendations before not only its members but non-members resident in its area. In connection with the compressing of wool in the bales it may be stated that the Committee found it necessary, owing to shortage of freight to refuse to accept for shipment bales weighing less than 15 lb. to the cubic foot with light types and 17 lbs. to the cubic foot in all other.

DIVISION OF VETERINARY RESEARCH.

A shortage of professional officers, combined with the great increase of routine work plus the influenza epidemic from which the staff at Onderstepoort suffered severely, rendered the carrying on of the work of the Division one of extreme difficulty, but thanks to the efforts of the staff and freedom from anything untoward in connection with diseases of stock, the immediate needs of the public in the shape of diagnosis, vaccines, etc., were attended to and a certain amount of research was conducted, though much work of great importance to the country had perforce to remain in abeyance. The division suffered heavy loss through the deaths of Mr. Robertson, who was in charge of the Grahamstown Laboratory, and of Mr. Dickerson, yard foreman of the same Laboratory, and Mr. Scroobie, temporary storeman at Onderstepoort, and in the conrse of the year three professional officers resigned in order to assume important positions elsewhere and one to qualify for medicine. During the continuance of the war it was impossible to obtain more professional assistance, but now it is over the prospects of doing so have improved and as a result of enquiries in likely countries throughout the world five young Veterinary Surgeons are being obtained from Switzerland, where it is understood the training in Veterinary Science is particularly thorough, and it is probable that others may be procurable in England or elsewhere. One or two suitable officers are also being transferred from the Veterinary Division and four students are expected to return from abroad in the course of the next few months and will be drafted either to this or to the Veterinary Division and by these means it is hoped the Division will soon be fairly if not fully staffed. The officers from oversea will be engaged on three years' contract at the same salaries as are paid to officers of equal experience here.

The establishment of a Veterinary College, which is referred to elsewhere, is being considered and if it is effected, as appears likely, the obtaining of recruits for the Veterinary Divisions will be greatly facilitated.

In order to provide for the growing needs of the Division provision has been made on the Estimates for one additional Senior Veterinary Reserach Officer and three additional Veterinary Research Officers as well as a number of additional laboratory assistants, overseers, farm foremen, etc., and the total Vote, including £15,000 for the investigation of Lamziekte, has been increased from £58,765 last year to £84,895.

The public spirited action of Sir Arnold Theiler, who was engaged in writing up his reports prior to retirement on pension, in consenting to take charge of the investigations into Lamziekte at Armoedsvlakte for a year has been of immense assistance to the Department as otherwise it would have been impossible to have kept the Lamziekte work going and pending the obtaining of more assistance, the station at Armoedsvlakte would have had to be closed.

During the year three dwelling houses were built at Onderstepoort and the erection was commenced of an electric and power plant, boiler house, water tower and stable for horse-sickness experiments estimated to cost £14,965; several buildings were also constructed or commenced at the Experiment Station at Armoedsvlakte, which when completed will cost £9,200, and in order to provide for other pressing needs provision has been made on the Estimates for the following additional accommodation at Onderstepoort:—Laboratories, £3,700; Manufacture of Wire Worm Remedy, £1,900; Commercial Branch, £4,500; four houses for staff, £9,000; and at Armoedsvlakte, for works of various descriptions to the value of £4,000. As a matter of fact so great are the demands upon the Division that even when these buildings are erected several other buildings will be required before it is capable of performing its duties efficiently and economically.

The work performed by the Division which is one of the largest and best equipped of its kind in the world is clearly set forth in Mr. Montgomery's report. During the year 114.557 letters and telegrams were received and despatched, and 24,139 blood smears and pathological specimens were examined and no less than 10,110,062 doses of vaccines and other preparations were issued. In addition to this 1,130 mules were inoculated for horse-sickness with a mortality of 1 per cent. a great advance on the results hitherto obtained, and 8,863 dosing spoons and 1,593 dosing bowls were supplied with the wire worm remedy. When it is remembered that the use of these remedies or preventatives has resulted in the saving of the lives and the improvement in the condition of hundreds of thousands of animals and in the opening up of vast tracts of country for the keeping of livestock which were previously unfitted for that purpose and that the great majority of them have been discovered since the establishment of the Department of Veterinary Research in the Transvaal which was the parent of the present Division, and that the manufacture of the remainder has been instituted in the country and improved upon, some idea of the advances that have been made and of the services rendered by the Division to the livestock industry will be realized.

Mr. Montgomery makes some pertinent remarks upon anthrax and quarter evil vaccines and the wire worm remedy, which though giving perfect satisfaction in the vast majority of cases have occasionally proved ineffective, and his suggestion, which is really an endorsement of one made by his predecessor, Sir Arnold Theiler, that the examination of blood smears should be done by the District Veterinary Surgeons instead of by the Division is a good one as the adoption of it would relieve the Division of a great deal of routine work and obviate the loss of time occasioned by sending slides from all over the Union to one or other of the three laboratories of the Division.

Further, the doing of a little microscopic work would be beneficial to officers in the country by helping to keep them in touch with laboratory methods. As already stated the Division was greatly handicapped on the Research side by the shortness of its staff, which is greatly to be regretted inasmuch as all advances in the control or eradication of diseases of stock mainly depend upon the light thrown upon them by scientific investigation.

The inoculation of horses against horse-sickness is not yet as simple or as safe as that of mules, but one by one the problems connected with the disease are being solved and last year 421 horses were inoculated experimentally with a mortality of 8·8 per cent.

In view of the indeterminate nature of the results obtained from many of the experiments at Armoedsvlakte and elsewhere with Lamziekte and of Sir Arnold Theiler being able to give his undivided attention to the investigation of the disease, it was decided to revise the whole of the work, and experiments based upon the knowledge previously acquired, and further enquiries and observations in the field have resulted in the artificial induction of lamziekte and established the fact that the disease is due to animals which have acquired an abnormal craving known as "pica," for bones and rubbish, eating flesh, bones and other animal tissues in certain stages of decomposition and infected with certain microbes. Further investigations into the disease are being prosecuted with a view to discovering the specific organism which causes the disease and the cause of "pica" and a remedy or preventative for the disease.

The discovery is one of the most notable of recent years and will it is believed prove of great economic importance by opening up vast tracts of land in Bechuanaland that are admirably adapted by nature for cattle farming, but which hitherto have been rendered almost useless for that purpose by the disease. The light thrown upon the disease should likewise prove a great boon to farmers located in areas not so badly infected as the areas just mentioned, but whose losses from the disease in certain seasons have been very heavy, and also in preventing the extension of the disease which apparently might readily take place.

The elucidation of the cause of the disease also furnishes a striking example of the advantage of concentration of work upon particular problems and of investigating them in the place in which they occur, for though much information had been gained by previous observations and experiments, it was only when Sir Arnold was able to devote the whole of his time to the investigation of the disease *in situ* that the matter was cleared up.

Investigations were also conducted into contagious abortion, redwater and anaplasmosis and calf pneumonia in cattle, slapziekte in horses, bloedpens, gouwziekte, stiff-sickness and wire worm and lung worm in sheep, and trypanosomiasis. When it is borne in mind that according to the last census, despite the discoveries of the Division and the advances made in the management of livestock, over 308,599 head of great stock and 2,921,696 head of small stock died of disease in the Union last year, the urgent necessity for further investigation is apparent.

The insurance of mules inoculated for horse-sickness against death from the operation, which was instituted many years ago, continues to prove satisfactory. The system is really a co-operative one inasmuch as each farmer who submits a mule for inoculation pays a premium of 5 per cent. on the value of the animal or in other words of 1s. in the pound on its value. If the animal dies its value is refunded to the farmer, who in many cases could ill afford to lose it, and if it survives, as 95 per cent. do, the advantage of possessing an immunized animal far outweighs the small sum paid for insuring it. The premiums, which are calculated on the proportion of deaths, slightly exceed the amount of the losses so the scheme is self-supporting and costs the country nothing.

A certain percentage of deaths occurs in inoculating animals for several other diseases and it would be a great boon to farmers and a great relief to the Department if the system could be extended to them.

The procedure in the case of animals inoculated by the owners themselves might not be quite so simple or easy to work as it is with animals inoculated by officers of the Department, but I feel sure that with a little consideration it could be managed.

DIVISION OF DAIRYING.

The present position of dairying in the Union is well reflected in the report of the Superintendent. The features of the year were the passing of the Dairy Industry Act and the continued progress in cheese-making and the practical cessation of imports both of butter and cheese. During the past few years there has been a remarkable increase in the production of cheese and though a good deal of inferior cheese is still made, the best is really excellent. It is estimated that the output of cheese last year was 1,280 tons in excess of that of the year before and it not only sufficed for the needs of the country but permitted of the export of 212 tons. 9,610 tons of butter were made in the course of the year, of which 658 tons were exported and but for the influenza epidemic, which occurred at the most critical time of the year, *i.e.*, the calving season, and led to many cows being neglected and allowed to suckle their calves instead of being milked, on account of the incapacitation of the farmers and their employees, and the plague of caterpillars, which destroyed large quantities of food-stuffs, the amount would have been much greater. Almost 75 per cent. of the butter produced is now made in creameries and the amount is increasing, which is satisfactory, as, though the best farm butter may be equal to and in exceptional cases, perhaps, better than creamery butter, the latter is as a rule far superior in quality and uniformity to it.

The official Milk Record Scheme is progressing and is likely to prove of immense value to the country by focusing attention upon the primary function of the cow, and the increased attention that is being paid to the milk and butter fat records of pure-bred animals is particularly welcome as any improvement effected in them will naturally in course of time extend to dairy cattle throughout the country.

Further reference to dairy cattle will be found in the notes on Livestock.

The passing of the Dairying Industry Act furnishes another mile stone in the onward march of the industry and though the administration of the Act will impose a great deal of work upon the Division, there can be no doubt that if properly carried out it will prove most useful to the industry as a whole. At the present time there are 64 creameries, 38 cream depôts and 138 cheese factories in the Union and some hundreds of private cheeseries. Though the development of dairying has been unexpectedly rapid and is most gratifying, yet, as Mr. Challis points out, vigilance and effort will be needed to enable the industry to maintain the position it has gained and to expand.

The experience of other countries shows that industries dealing with products like butter and cheese that are perishable and liable to vary greatly in quality and to suffer if improperly handled or not marketed in an attractive and uniform condition, are particularly in need of advice and supervision by the State and in view of the present and potential value of the dairy industry to the Union, no efforts should be spared to assist it.

The Division which from the first has kept closely in touch with the industry has already done a great deal by wise and tactful advice and by providing for the uniform packing of butter and cheese exported and by grading butter and cheese for export, and in some instances, at the request of the factories themselves, grading these products for sale locally, to assist in building up the industry, and with the aid of the legislative machinery now at its disposal it will be able to do much more, but extensions are still needed, particularly in the direction of scientific investigation of problems affecting dairying in this country and in the training of experts for the Division and managers and assistants for factories and so forth, for whom there is a considerable and growing demand which under existing circumstance is difficult to meet, and as stated in my last report the time has now arrived when a fully equipped Dairy College should be established in connection with one of the Schools of Agriculture to which it would form a natural extension.

DIVISION OF BOTANY.

The Chief of the Division states the demand upon the Division during the past twelve months have again been exceptionally heavy, both as regards requests for information and advice, the investigations of pressing botanical and pathological problems and the attendance of officers at farmers' and fruit growers' meetings.

Though the staff and equipment of the Division and the provision for applying botanical science to agriculture have developed to a greater extent than would have been deemed possible a few years ago, the demands upon it are continually increasing.

During the year the Division was strengthened by the appointment of Dr. E. P. Phillips, but Miss A. M. King left to get married. Provision has been made on the Estimates for an additional Herbarium Assistant and an extra Lay Assistant and for two Botanical Assistants and two Herbarium Assistants for the Botanical Survey and for another clerk, but even when these officers are obtained the staff will be insufficient to cope with the work needing attention. The fruit growers in the South-western and South-eastern portions of the Cape Province where fruit growing has become an important industry and, if properly supported is capable of great expansion, are pressing, and deservedly so, for a mycologist to be stationed in their vicinity to assist them in dealing with the diseases that harrass them so severely, and similar requests have been received from fruit growers in other areas. Steps are being taken to provide a mycologist for the Western Province, who will be stationed either at Cape Town or Elsenburg, and it is hoped a mycologist for the Eastern Province will shortly be forthcoming.

There is already a Plant Pathologist at the Botanical Station at Durban and there are Botanists and Entomologists or provision for them at the Schools of Agriculture, and there are Entomologists at Cape Town, Durban and Port Elizabeth in addition to Pretoria, so when the Mycologists under discussion are provided and the vacancies at the schools are filled, as it is hoped they soon will be, the Union should be fairly provided for as far as diseases of plants are concerned, though, as Dr. Pole-Evans points out, field stations for the investigation of particular diseases on the spot may from time to time be necessary; he also refers to the need for a Physiological Botanist or a Biological Chemist with proper facilities in the shape of staff and equipment, and I heartily support the suggestion. Hitherto the efforts of the Division have been devoted mainly to diseases of plants and certain other aspects of botany which for various and sufficient reasons have been recorded priority, but the most important subject of all—the improvement of our field crops—has not yet received the attention it deserves.

As I have frequently pointed out the yield of practically the whole of our staple crops is alarmingly low and, unless something can be done to place matters on a better footing, they are likely to diminish rather than to increase, and if they do large areas of land that at present barely repay the cost of cultivation, will, instead of being put to better use as they ought to be, go out of cultivation altogether. The increase of the productivity of the staple crops of a country is one of the most difficult of problems and on account of its complexity many agents will have to be employed in the solution of it and foremost amongst them will be plant breeders and botanists who have specialised in the growth and nutrition of plants.

A start has already been made in plant breeding and some valuable work has been conducted in the breeding of wheat at Elsenburg by Mr. (now Professor) Neethling, and we have a highly qualified plant breeder at Potchefstroom in the person of Mr. Caporn, a pupil of Professor Biffen, of Cambridge, and several of our chemists are devoting a portion of their time to the study of soil fertility, but provision for plant physiology is still entirely lacking and more facilities are needed in both of the previously mentioned branches, and in the interests of the country should be provided as speedily as possible.

As is only to be expected from the constant increase in the activities of the Division it is continually outgrowing its accommodation and at present it is greatly hampered for lack of laboratory and other rooms. A small greenhouse has been moved from the Botanical Station at Durban, where it was no longer required, to Pretoria where it will be most useful, and the large greenhouse for infection work which has been so long on order has at last arrived and is in process of erection. A detached building for the herbarium and library is urgently required, both as a safeguard against fire and to release space in the existing buildings that is badly wanted for other purposes. As already remarked it appears as if the plot of ground known as Prinshof will soon revert to the Department and when it does it will prove of the greatest service to this and to other Divisions requiring facilities for outdoor experiments.

The Division has continued to investigate certain diseases of livestock in which plants are believed to play a part, in conjunction with the Division of Veterinary Research, and is also projecting experiments with poisonous plants in co-operation with the same Division.

The practice of sending bulk samples of plants or their products likely to prove useful in commerce, to authorities in Europe to ascertain their merits and value, which has already resulted in the acquisition of a vast amount of most valuable information upon the plants of the country, has been continued, and during the year a number of plants that appeared likely to be useful for fibre, paper-making, dyeing, oil, food for livestock, medicine and other purposes were collected or specially grown and sent to the Imperial Institute and the Wellcome Chemical Laboratories for examination and report, and our best thanks are due to the Directors of those Institutions for the great pains they took to ascertain the commercial value of the samples submitted to them. A list of the plants forwarded and the gist of the remarks upon them is included in the Botanist's report.

There has been a steady demand for plants of the so-called "Kikuyu grass," which was introduced by the Division of Botany, from German East Africa. The grass is being grown largely throughout the country and where the conditions are suitable it constitutes a very valuable addition to our lawn and pasture grasses.

The Director of Agriculture of the East Africa Protectorate has kindly secured for the Department seed of another variety of grass that he thinks will be even more useful than Kikuyu and which will be thoroughly tested next summer.

Leaves of the different kinds of spineless cactus imported and propagated by the Department have been in request and the plants are grown to a considerable extent in the parts of the country adapted to them and are proving very useful for food for stock, particularly in times of drought.

As these crops have now been thoroughly tested and are being grown in quantity at the Schools of Agriculture, the distribution of them will in future be undertaken by the schools who can do such work better and more promptly than the Division can: the change will also relieve the Division of what has now become purely routine work.

Teff grass (Eragrostis Abyssinica) which was obtained from Abyssinia by the Transvaal Division of Botany before Union has become firmly established and is now extensively grown in the High Veld and the introduction of it has, probably, been worth more to the country than the total outlay upon the Division since its inception.

The Department of Railways and Harbours which consumes large quantities of oil is interested in the growth of castor-oil plants from seed and after consultation with the Division has decided to grow several acres of the plant in a part of the country deemed suitable for it. Previous experiments indicate that the plant can be grown successfully in the Union, but whether profitably or not has still to be ascertained and if, as is hoped, the experiments prove successful the crop will prove a welcome addition to our rapidly increasing list of crops and help to utilize ground which is not very valuable for other purposes and to render the Union more self-supporting in the matter of agricultural products.

The Phanerogamic Herbarium, of which Dr. Phillips is in charge, is growing rapidly and in the course of the year 5,724 sheets were mounted and 6,844 specimens were received and 910 determinations were made for correspondents and collectors. The Herbarium was further enriched by the purchase of the whole of Miss Pegler's collection of Kentani plants, and Madam Dieterlen has generally promised to give to it the whole of her fine collection of Basutoland plants.

The Mycological Herbarium, of which Miss Bottomley is the Curator, and which is also becoming a very valuable collection, was increased by 967 specimens.

The commencement of what promises to be a first-class botanical museum has been made and the Divisional Library was strengthened by the purchase of an important collection of botanical books from Mr. E. Galpin and by other works.

A great advance in Botany in South Africa and one which should render the year memorable in the annals of Botany in the sub-continent has been registered by the inauguration of a botanical survey of the Union. The want of such a survey has long been felt and thanks to the better appreciation of the value of botany and the warm advocacy of the Scientific and Technical Committee, the Government was induced to sanction the project.

The survey will be conducted under the directorship of the Chief of the Division in co-operation with eminent Botanists throughout the country and the objects of the survey and the steps that have been taken in connection with it are clearly set forth in Dr. Pole-Evans' report.

No new diseases of great importance were observed during the period under review, but many diseases were investigated and the campaign against citrus canker, a disease which was, unfortunately, unwittingly introduced into the country some years ago and has rightly caused great alarm to citrus growers, has been systematically and vigorously pursued with, there is every reason to believe, good results; as not only has the spread of the disease been arrested but in the great majority of infected centres it has been stamped out. So far £58,804 13s. 8d. has been expended upon the eradication of the disease and a further sum of £30,000 has been placed on the Estimates for next year; after it is spent the payment of compensation for infected trees, should any such be detected, will cease in accordance with the terms of the Agricultural Pests (Citrus Canker) Act, No. 10, 1919, but the inspection of trees in all areas, where there is any reason to fear a recurrence of the disease, will be continued. Particulars of the action taken and the progress made against citrus canker and of the investigations into it and other diseases are given in the report of the Division.

Now that the new greenhouse has been obtained and better facilities for out-door experiments in the shape of Prinshof are likely to be available, it is hoped that the investigation of rust in cereals which is by far the most important and pressing mycological problem in the country, will be resumed.

During the year 42 publications of various kinds were issued by members of the staff.

TOBACCO AND COTTON DIVISION.

The appointment of Mr. Taylor as Tobacco and Cotton Expert to the Rhodesian Government, and Mr. Wilson as Tobacco Expert to the Indian Government, though complimentary to the Division, is a serious loss to it.

Owing to the influenza epidemic the tobacco crop will not be quite so large as last year and is estimated at 10,000,000 lbs. An amount equal to about one-fifth of this was exported.

The Annual Congress of Tobacco Growers was held in February where many important matters were discussed and resolutions passed, and the method of developing the export trade received considerable attention. Since the Congress was held one Tobacco Society has sent its Secretary and one of its directors to Europe to study the requirements of the trade.

An example of what can be realised from tobacco growing is furnished by the receipt of £2,600 from Turkish tobacco grown on 10 morgen of ground. Owing largely to the advice given by the Division a Tobacco Association was formed in the Orange Free State by which during its first year its members obtained £4,000 more than they would have done, had they not been organised.

It is estimated that there are now 12,000 acres of cotton in the Union, an area more than double that of 1916-17, and the crop is calculated to yield one and a half million pounds of seed cotton. The amount of ginned cotton exported was 183,228 lbs., valued at £11,799 and was equal to four times that exported in the previous year. Cotton ginning is on the increase and a seed crushing plant for extracting oil has been established. This industry if properly developed will prove of great benefit to the country, not only by the work it will provide and the revenue it will produce, but also because of the value of the bye-products obtained in crushing.

The initial difficulties in cotton farming in South Africa have been the shortage of sufficiently skilled labour and the ravages of insects already present in the country, but these are gradually being overcome. The quality of the cotton grown here is better than that of the corresponding varieties produced in some of the chief cotton growing countries, and with the high prices now obtained on the markets, the crop is a very remunerative one. Owing to the world shortage of cotton these high prices are likely to continue for some time to come, and a good opportunity is therefore presented to South African farmers of undertaking and extending the growing of this crop.

DIVISION OF HORTICULTURE.

During the year Mr. R. A. Davis, Chief of the Division, retired on pension, which as a matter of fact he had been entitled to do for some time past, in order to accept a post outside the Department. Mr. Davis was appointed Horticulturist to the Transvaal Department when it was formed in 1902 and he rendered conspicuous service in connection with the production and export of all kinds of fruit, and his departure from the Department will be a serious loss both to it and to the industry whose interests he has so much at heart.

The Exeriment Station at Warmbaths was closed at the end of the year. The orchard was found to be infected with citrus canker and in accordance with the regulations had to be destroyed.

The Chief of the Division lays stress on the abortive results of many of the experiments that have been attempted in nursery work. The cause seems to have lain in the multiplicity of duties of the officers entrusted with them and it is unlikely that any really satisfactory investigations will be done until separate officers are appointed to undertake them.

With regard to the alternate scheme suggested by Mr. Tribolet, I am afraid the factors which militated against success at the Schools and Experiment Stations would operate even more powerfully were the work put into the hands of nurserymen: the solution lies in better provision being made for research at the Schools of Agriculture and in the establishment of an Experiment Station close to Union Buildings. A College and Experiment Station for the training of Horticulturists and for the conducting of research in connection with Horticulture is badly needed and likewise several additional itinerant instructors. The industry has already attained large dimensions particularly in respect of citrus fruit and its future is so promising that it is worthy of all the attention that can be bestowed upon it. It is also to be feared hat if more expert advice is not forthcoming many of the land settlement and ready-made orchard schemes that have been started will if they do not come to grief, at all events, be seriously jeopardised.

The Division is seriously understaffed and as I have said in previous reports in view of the advances that are being made in the growth of different kinds of fruit thoroughly competent officers are required to deal respectively with citrus fruit, deciduous fruit and sub-tropical fruit and if not obtainable in this country should be procured from oversea.

According to the census there are now 2,515,882 citrus trees, an increase of 61 per cent. on the numbers given in 1911, and 13,709,947 non-citrus fruit trees, an increase of 41 per cent. on the numbers given in the previous census. Citrus trees continue to be largely planted and there is little doubt but that the industry is destined to become an important one, but with citrus as with every other crop care must be taken to ascertain whether the soil is suitable before starting. A great many citrus trees have been planted in districts noted as good for citrus on hungry gravelly soils, with the result that the growth is poor and the fruit inferior. Citrus trees require deep rich soil, and even if the climatic and other conditions are suitable and the cultivation good, so long as the soil is thin, light or poor, the trees will not thrive.

The export of fruit in common with that of many other products was restricted by lack of freight. Nevertheless it amounted to £111,006, which was £44,693 more than in the year before, the increase being chiefly in dried and preserved fruits—fresh fruits of all kinds except apples being considerably reduced. The import on the other hand of similar articles (except nuts and seeds used for the manufacture of oil) was still further decreased and bids fair soon to be of but minor importance.

DIVISION OF VITICULTURE.

Mr. van Reenen was appointed Manager of Constantia in place of Mr. Versfeld, who resigned. The Division is still handicapped by shortage of staff; officers for research and itinerant instruction are urgently needed. Many problems in grape growing and wine-making await solution and the Institute established at Elsenburg has been equipped for investigating them, and it is earnestly to be hoped that the necessary staff will be provided for it before long.

Owing to the adverse weather and the difficulty of obtaining sulphur for spraying and the inferiority of such as was obtainable, the grape crop of 1918 was not a heavy one nor was the wine made of particularly good quality. It is estimated that some 100,000 leaguers were made, and the price obtained averaged from £10 to £12 per leaguer. Nearly 500,000 gallons of wine were exported at a value of £100,000, while vinegar, raisins, currants and grapes exported realised nearly £100,000. According to the Census there are now 87,839,966 vines on 22,285 morgen of land.

Experiments carried out during the year provided some valuable information in connection with the grafting and stratifying of vines of which particulars will be found in the Report of the Viticulturist. More information on American stocks is needed: owing to various causes they have not been uniformly successful. It will be remembered that a committee inspected and reported on the behavior of these stocks a few years since. It is now proposed to send another committee round the vine-growing districts to renew the investigation.

Additions continue to be made to the collection of grapes at Paarl, which now contains over 200 varieties and is proving most useful.

The annual short course in wine-making at Elsenburg, at which Dr. Perold kindly assisted, was attended by 24 students of whom 20 were farmers and three were engaged in the wine trade, and but for the Influenza the attendance would probably have been larger. The presence of 8 students who had attended previous courses and the intention expressed by several, to attend the course again next year testify to the appreciation with which these courses are held.

Constantia, which has now been included in the Division of Viticulture, has been considerably improved during the year, but I regret to say, no steps have yet been taken to erect a dwelling house for the Manager. As I urged in my report two years ago the provision of separate accommodation for the Manager would give greater protection from fire to the beautiful old house of Governor van der Stel, and would moreover allow of greater freedom of access to it by the public, and it is earnestly to be hoped that consideration will be given to the subject.

The sale of wine at high prices before it was made, as was the custom during last season owing to the keen demand, was attended with a regrettable lack of care in the vintage, and in his report the Viticulturist states that of two thousand leaguers purchased by one firm, only one-tenth was of first-class quality.

DIVISION OF ENTOMOLOGY.

The Division is lodged in two dwelling houses situated at the corner of Church and Wessels Streets, not far from the Union Buildings; the quarters are good in their way and constitute a great advance on the previous ones, but it is highly desirable that a building should be erected for the Division with up-to-date laboratories, etc., for which an excellent site is available near to the Union Buildings, where the greater part of the Department is housed, and also to the Botanical and Chemical laboratories, and the Prinshof Experiment Station. The grouping of the Divisions in this way would be very helpful to the Department and the Division and would be convenient to the public. The releasing of the two commodious and desirable dwellings now occupied by the Division would also help to relieve the shortage of houses which is so acute in Pretoria.

After a long search suitable and convenient quarters have been found for the Entomologist at Durban in the building formerly used as an Observatory situated on the Berea, close to the Botanical Station.

With the exception of the transfer of Mr. S. H. Skaife, Assistant Entomologist, to Cedara and the resignation of Mr. King, Plant Inspector at East London, no changes occurred in the personnel of the staff during the year, but several alterations were made in the disposition ofit. Included in the re-adjustments was the stationing of an Entomologist at Port Elizabeth who will inspect plants arriving at that port from oversea and do work in the Eastern Province of the Cape in the same way as is done by the Entomologists located at Cape Town and Durban; this is in accordance with the plan we have been working up to of having all plants entering the country from abroad examined by professional officers and which is now nearly completed.

What with the Entomologists in the Division in Pretoria and those quartered at Cape Town, Durban and Port Elizabeth and the Lecturers in Entomology at the 5 Schools of Agriculture and the 2 newly established Faculties of Agriculture, the Union is much better served with Entomologists than ever before, but Mr. Lounsbury pleads earnestly for more assistance and he is fully justified in doing so, for owing to the extension of the area of land under crop and the rise in the value of the crops, insect pests are, as is usually the case under such circumstances, increasing and their effects are more severely felt; for instance our staple crop—maize—is menaced by cut-worms and borers, and fruit and cotton are also greatly harassed by insect-pests and can only be protected from them by intelligent and unremitting attention.

Further, as Mr. Lounsbury points out, if the closer settlement of the country and the increase in small holdings—which are such a hopeful feature of the times, and to promote which Government and private individuals have spent and are spending vast sums of money in irrigation and other works—are to succeed it is imperative that more aid both in the shape of investigation into the cause of the troubles experienced from insects and of advice and practical assistance in dealing with them is forthcoming.

The publications of the Division included 8 Bulletins and 2 contributions to the transactions of Scientific Societies and a number of typical articles written for various farming and gardening purposes, but, as Mr. Lounsbury remarks, the usefulness of the Division in the direction of issuing advice to farmers is greatly curtailed by the suspension of the journal.

The Department is deeply indebted to Mr. E. Anderson, Professor of Agricultural Chemistry at the Transvaal University College, for the careful and minute investigation he voluntarily conducted into locust poison which has thrown light upon many points connected with the poison which were previously in doubt and will be of great assistance to the Division.

No swarms of locusts were reported during the year and as the Division is in touch with every part of the Union and of the sub-continent there is good reason for believing none was present. It is perhaps too early to assert that the pest has been completely overcome, though there are good reasons for hoping and believing that such is the case, but whatever the future may have in store it is clear the campaign against locusts has been attended with great success. As has been pointed out in previous reports it is unlikely that the pest will ever be completely eradicated owing to the disposition of solitary locusts to flock together as they increase in numbers, but the experience of the past 17 years proves that if the existing organization is maintained and the measures now in force are persisted in locusts can be controlled and the country protected from loss by them. It was formerly held that the locusts that infested South Africa came from the Kalahari or from the North, but the closer study of the subject made during the period referred to indicates that such is not the case and that the locusts which troubled the country in the past were bred within its borders and not beyond. Further, if, as of course is always possible in a country like this, occasional swarms should enter the Union from beyond, their descendants could be satisfactorily accounted for by the agencies that have been created.

To estimate the benefit derived from the destruction of locusts would be a difficult matter, and the reduction of the pest has been in progress for so long and accomplished so unostentatiously that the work which has been done has not attracted much attention, but one has only to cast one's thoughts back a few years to the time when swarms of locusts used to pass over the country like clouds of smoke from veld fires and devastate it by consuming the crops, the veld and practically every particle of vegetation and to recollect how powerless the individual was to cope with them and to remember that severely as their effects were felt then they would be infinitely more crushing now that the country is so much more closely settled, to realize the relief that has been given.

The results that have been attained have been due, firstly, to the discovery of the method of destroying locusts whilst in the hopping stage by means of sweetened arsenic by Mr. Wilkinson, a sugar planter in Natal, and without which little could have been done, as it constitutes the only practical means yet discovered of destroying locusts in a country like this, and secondly, the legislation that has been passed in the first instance in the Transvaal and later for the Union, and thirdly, to the efficient organization and systematic conduct of the campaign by means of which the movements of locusts were noted throughout the sub-continent and the places where they laid their eggs located, and the young ones destroyed as soon as they appeared.

In this connection great credit is due to Mr. Claude Fuller who as Entomologist to the Natal Government was the first to put the arsenic and sugar method of destroying locusts into practice on an extensive scale and to the late Mr. C. B. Simpson, Chief of the Transvaal Division of Entomology, who inaugurated the campaign for the destruction of locusts in the sub-continent and was responsible both for the legislation upon which it was based and the manner in which it was organized, and also—with the powerful assistance of Lord Selborne who when High Commissioner for South Africa interested himself in the movement at a time when it was particularly in need of support—for the establishment of the Inter-Colonial Locust Bureau, an institution that was essential to the prosecution of the work before Union, and lastly to Mr. Lounsbury who as Chief of the Division has been responsible for the whole of the work since Union.

But though the country was happily delivered from locusts certain other pests were worse than usual. A species of caterpillar (*Laphygona exempta*), which has been designated the Army Worm, appeared with dramatic suddenness and in countlesss numbers throughout the greater part of the High Veld and did enormous damage to young crops particularly those of the grass family and to the grasses in the veld. Previous outbreaks have been recorded, but none so extensive or severe as that of last season, of which a full account is given in the report of the Division. Cut worms and stalk borers were likewise prevalent and did great damage to the maize crop. These pests which appear to get worse as the growth of maize extends, have been studied by officers of the Division for a considerable period and Mr. Mally who has devoted special attention to the latter has published several articles on it and is at present engaged on a bulletin on the insect and its control.. Investigations show that the pest can be overcome but the problem is how to do so at a cost that the crop which brings in a comparatively small return per acre can bear.

A good deal of attention was given to the study of European Foul Brood in Bees, the discovery of which was mentioned in my last report and, as the result of extended investigations into the subject by Mr. Attridge who is an expert in bees, Mr. Lounsbury, who discusses the matter at length in his report, has formed the opinion that the disease " is practically omnipresent amongst bees in South Africa, but that it is exceptional for it to ravage colonies very severely." Mr. Lounsbury pleads for a specialist in bees and I heartily endorse his request, for the industry is calculated to serve a very useful purpose and is thoroughly deserving of support.

In view of the potential importance of cotton as a staple crop for the middle and low veld coupled with the fact that many of the pioneers of the industry have been much disheartened by losses attributed to insects, the Division is paying special attention to insects that attack the cotton plant.

The diminution in the imports of plants from oversea that has been so noticeable since the beginning of the war, has continued. The introduction of new varieties of plants, particularly those of economic importance, is obviously desirable and is illustrated by the value of the teff and kikuyu grass recently introduced by the Department and by the fact of maize and nearly the whole of the crops grown in the country having been imported. But it must also not be forgotten that every plant brought into the country is a possible conveyer of new pests which may cause great loss like the citrus canker which was introduced into this country and the U.S.A. from Japan despite close scrutiny by the Departments concerned and has cost us £90,000 to combat and America still more, and other diseases mentioned by the Chief of the Division in his report, which all shows that no matter how closely the plants are inspected there is always a danger of some disease escaping detection. In addition the purchase of plants from abroad entails the sending of large sums of money out of the country which might be retained in it and of getting work done elsewhere which would furnish very useful occupation for the inhabitants of this country. For instance in 1913, the last complete year before the commencement of the war, we imported 16,538,900 lbs. of seed potatoes valued at £52,631 whilst during the past 5 years the total imports have only amounted to 7,291,662 lbs. valued at £26,819 or a saving of £263,155 on the pre-war average. The opinion used to be held that the quality and yield of potatoes could not be maintained without considerable and constant importation of fresh seed but as far as can be judged from potatoes exhibited at shows and sold on the markets there has been no deterioration in quality. It is true there has been a reduction in the yield but it is probably due more to the cost and scarcity of fertilizers than to the lack of imported seed, for many good growers hold that if care is taken in the selection of the seed and it is changed from one variety of soil and climate to another the local seed yields as well as the imported. The same arguments apply, but with more force, to the introduction of pear, plum and cherry stocks inasmuch as the necessity of importing them to improve the yield and the quality of the produce cannot be urged in defence of their introduction. The importation of apple stocks was prohibited some years ago and experience has proved they can be raised quite well in this country though last year owing to the influenza and the unexpectedly rapid extension of apple growing the supply seems to have been unequal to the demand. But the other stocks mentioned are still admitted and I am of opinion they should be prohibited. Mr. Lounsbury states that in one small lot of pear stocks imported from France last year were found 10 cocoons of unidentified moths, one cluster of living eggs and several varieties of scales new to the country as well as crown gall, and that practically every consignment was infected with scale and other insects not known here.

Inquiries made of two of the largest nurserymen in Australia show that no difficulty is experienced by them in raising pear stocks from French seed and that being the case there is little doubt they could be raised equally well here and the only reason why they are not seems to be that they can be purchased cheaper abroad than they can be propagated here, but I submit the slight saving of expense is far outweighed by the risk involved and forms no justification for continuing it. Last year 136,500 fruit tree stocks, mainly for pears, were imported.

Mr. Lounsbury advocated the establishment of a Plant Introduction Garden or quarantine station; the proposal has much to recommend it and if the introduction of pear stocks, which constitute by far the bulk of the importations, be prohibited as suggested, it might be possible to do so, though the expense would be considerable and it would not be an absolute safeguard as is shown by the outbreak of citrus canker which emanated from one of the nurseries of the Department.

DIVISION OF CHEMISTRY.

The Division has been strengthened during the year by the appointment of Mr. van Wijk as Assistant Chemist, and it has been provided with a clerical assistant and typist.

The work of this Division has in the past been greatly handicapped by the restricted and inconvenient quarters in which it was housed, but I am glad to say funds have now been voted for the erection of new laboratories and a site for the same has been secured near the Union Buildings and the Botanical Laboratories. The situation will be a very agreeable one and there will be sufficient ground round it for pot experiments and so forth and it is also near to the ground known as Prinshof which is reserved for an experiment station for the Department, and the erection of the laboratory will be another step in the concentration of the Divisions of the Department.

At the commencement of the year the administration of the Fertilisers and Farm Foods portion of the Farm Foods, Seeds and Pest Remedies Act was transferred to this Division, which naturally imposed a good deal of extra work upon it particularly in the preliminary stages of Registration. Prior to putting the Act into operation a conference of Chemists of the Department under the chairmanship of Dr. Juritz was called, to draft regulations and draw up uniform methods of analysis, which have since been adopted.

A noticeable feature of the applications for registration was the number relating to mixed fertilisers, upon the use of which the Chief of the Division offers some pertinent remarks.

Provision is being made for a systematic survey of the soil of the Union. The necessity for such has long been recognised and a great deal of preliminary work has been accomplished by the Division and at the Schools, but owing to lack of accommodation and staff, it was not possible to make a beginning before. The survey may perhaps not fulfil the extravagant expectations placed upon it by many farmers, but it cannot fail to throw much light upon the resources of the Union and provide information of great value both to farmers and to the Department.

In addition to the routine work investigation was continued on the soils of the Pretoria district, and determinations were made of the nicotine content of tobacco with reference to the possible manufacture of tobacco dips, full details of which will be found in the report of the Chemist.

AGRICULTURAL RESEARCH CHEMIST.

This officer who is stationed in Cape Town, though still handicapped by shortage of Chemical Equipment and material, unobtainable except in small quantities and after long delay during the war, carried out numerous investigations into the possibilities of utilising many of our natural products.

In addition Dr. Juritz spent nearly five months touring the Union as a member of the Departmental Committee on Wheat Growing in the course of which he collected a large number of soils for analysis. The results of the examination of these samples with other valuable information collated by him concerning the Wheat Soils of the Union will be found in Appendix IV to the Report of the Committee.

Inquiry was made into many possible sources of supply of fertilisers but except in the case of samples of Nitrate of Potash from Prieska, and of the guano and lime deposits that are already available and being used, none of them gave sufficiently high analyses to indicate that they would be profitable to work or transport long distances.

Of the miscellaneous investigations carried out, Lichen was analysed for percentage of starch, Wattle barks from the Paarl and Transvaal examined for extract, and Eucalyptus leaves for oil and blistering beetles for cantharidin. In collaboration with the Entomological Division an inquiry was made into the risk attending the eating of beans several months after they had been fumigated with hydrocyanic acid, and the conclusion was arrived at that with ordinary precautions, there is very little danger.

Details of the results obtained from the investigations carried out during the year will be found in the Report of the Agricultural Research Chemist.

LIBRARY AND PUBLICATIONS.

During the year 785 bound volumes were added to the Library, exclusive of a very valuable collection of Botanical works purchased from Mr. Galpin of Queenstown, and 558 volumes were bound by the Prisons Department and 1,810 reports, transactions, and proceedings of scientific societies and magazines and newspapers were presented to it, or received as exchanges or purchased, against 1,719 in the previous year, and 3,910 persons visited the Library in the course of the 12 months. The total expenditure on books for the two branches of the Department amounted to £1,704. The Library which was formed from the nucleus of the one established in the Transvaal before Union (previous to which there was no collection of agricultural books of any note in the country), augmented by the books in the possession of the other Departments of Agriculture at Union, now comprises 21,000 bound volumes and 13,700 reports, bulletins, etc. The main collection is housed in a handsome room in Union Buildings and the books in constant use by the Divisions are deposited with them, and smaller libraries are maintained at the Schools of Agriculture and Experiment Stations, and the whole of the books are recorded in the catalogue which is now being revised and brought up to date and provided with information as to their location so the whereabouts of the whole of them can be readily ascertained.

In order to assist farmers and others interested in Agriculture as much as possible, books are loaned from the library for short periods under certain conditions. The project is a worthy one—agricultural works are often difficult to obtain—but it is to be hoped that it will not be extended to too great lengths as it is essential that the function of the Library, which is primarily a reference one for the use of the Department and the public, be not impaired, and what is really required is a duplicate collection of books for circulation amongst the public.

Though the Library has made good progress and has proved most useful to the Department and in fact is indispensable to it and also to the public to whom it is always open, it is yet not nearly as well stocked as it ought to be and more books are greatly required both by the central Library and by the libraries at the Schools in particular and also by most of the Divisions. So far the Library, which is a public one in the best sense of the word as well as a departmental one, has not benefited at all by private benefactions and it is to be hoped that persons possessing books likely to be useful to it will remember it when disposing of them; books relating to travels and natural history in South Africa would be particularly useful and no fear need be felt of duplication as with so many sub-libraries at the Schools and Divisions additional copies will always be useful.

Besides attending to the books and the issue of departmental publications the Librarian was also largely occupied in obtaining information on matters relating to agriculture for the Department and for the public.

The suspension of the publication of the journal in 1914 considered necessary at the time by reason of the uncertainty of the position created by the outbreak of war was a great misfortune, and I am glad to say arrangements are now being made for the re-issue of it, and also for the preparation of a hand-book for farmers. A very encouraging sign of the times is the growth in the number of books and newspapers dealing with agriculture and kindred subjects; a few years ago there were none, now there are numbers of really excellent and widely read books and newspapers.

DIVISION OF CO-OPERATION.

There are now 31 active societies registered under the Co-operative Acts of the Orange Free State and the Transvaal, and 9 of them were formed during the year. Most of the new societies are in the Orange Free State and there are now fifteen in that Province and sixteen in the Transvaal.

Owing to the lack of the necessary legislation in the Cape and Natal, Co-operative Societies in those Provinces are not supervised and assisted by the Co-operative Division to the same extent as in the two Provinces above mentioned, but a few unlimited liability Societies have received advances from the Land Bank under Act No. 30 of 1916.

The original Co-operative Societies were mainly concerned with the sale of produce for members—which chiefly consisted of maize and tobacco—and with the supply of implements to them, but some of the new Societies are manufacturing cheese and others supplying dairy cattle.

The number of members at the end of the year was 9,658, or 215 more than in the previous year.

The total turnover of Societies was £838,828 and this represented an increase of 41 per cent. on that of the year before.

In the past the special dangers and difficulties besetting Societies and responsible for their failure have been the admission of unsuitable persons as members, sales on credit of implements and other farm requisites, excessive advances by Societies to members against produce for sale, high administrative charges, disloyalty of members and the failure of some of them to take sufficient interest in the working of the Societies.

Now, however, many of these evils are being remedied, Societies are purging themselves of undesirable members, credit sales are being limited or stopped altogether, advances on produce are being reduced to a reasonable basis, the working expenses though still high in some cases, are being brought down, and more interest though still insufficient is being shown by members in the affairs and working of their organisations.

Unfortunately some societies instead of selling their produce when received and ready for sale are displaying a disposition to retain it, in the hope of obtaining higher prices by so doing. This savours of speculation and is strongly to be discouraged, for although in a few instances it may be profitable, in the long run it is almost certain to prove unremunerative, and in any case it is a hazardous and unwise proceeding.

Co-operation in South Africa is making steady progress and farmers have shown that they are ready and willing to adopt it and gain the benefits it offers.

The societies established do not yet cover the whole field and it is confidently anticipated that the success attained by many of them will have the effect of stimulating the rise of others, and that before long there will be organisations, on co-operative lines, making provision for credit, for insurance against hail and stock disease and other risks, for the disposal of wool and many other objects.

It has been argued that the work performed by the Co-operative Division should be undertaken by the Land Bank, but this I think would be wrong. The business of the Co-operative Division is to advocate and advise, that of the Land Bank is to advance money impartially and with due regard for security, and were the two agencies combined it is more than likely one or other would suffer.

DIVISION OF DRY-FARMING.

As usual the Dry-Land Agronomist has been actively engaged in exploring the country and studying local conditions and instructing farmers in the best methods of utilizing the land in the dry parts of the Union by lectures, demonstrations and correspondence. During the year he also performed useful service as a member of the Wheat Committee.

Mr. du Toit reports favourably on the system of co-operative experiment with different varieties of seed conducted by the Division amongst farmers on an extensive scale, though his experience is somewhat contrary to the experience of other Divisions who have complained of the tendency of farmers to lose interest in the experiments after they have been started and the novelty has worn off and to neglect them at critical times in favour of their main crops. Seed is supplied by the Division to farmers on the understanding that double the quantity is returned after harvest, should the crop prove successful; and under the scheme 1,045 experiments were conducted by 433 farmers during the year.

The Dry-Land Experiment Station situated in the Pietersburg Townlands and subsidized by the Municipality to the extent of £100, has been worked in a modest but very efficient and economical manner and has been most helpful to the farmers of the district. An account of the experiments conducted at it and of the varieties of crops found most suitable for the district is given in the Report of the Division.

GUANO ISLANDS.

The activities of this Division include the collection, allotment and distribution of guano, and collection and sale of penguin eggs, sealskins and seal oil, which are all obtained from the islands along the West and South Coasts of the Union.

8,011½ tons of guano were collected last year or over 1,000 tons more than in the year before, and, with the exception of that of 1914, the crop was the largest on record. With fertilisers so scarce the large yield was most opportune and acceptable.

The applications for guano are continually increasing and during the past year the quantity applied for was equal to between seven and eight times the amount available. In the first allotment in August, 1918, the issue was confined to the production of essential foodstuffs, and the second, in February, 1918, owing to the shortage of flour, was limited to the growing of wheat and rye. Details of the principles adopted in the distribution, the number of applicants and the amounts applied for, will be found in the Report of the Superintendent.

The use of guano is still chiefly confined to the Western Province, where the growing of wheat and oats is largely dependent upon it.

In view of the great value of the guano to the country, I would suggest that it might be well to engage a competent zoologist to visit the islands and ascertain whether any measures could be taken to increase the supply by the better protection of the birds or by extending their sanctuaries.

During the year sealing on the islands resulted in a revenue of £21,000.

Year after year the Superintendent of the Guano Islands, owing to the difficulty of obtaining transport when and where required, the annual cost of it, and the risk of shortage of water on the islands, has made repeated requests for the provision of a steamer owned or controlled by Government. It may be pointed out that the annual cost of freight has been doubled in the last five years, and now amounts to £12,000 which is equal to about one-seventh of the total revenue from the islands.

DIVISION OF GRAIN.

Reference has already been made to the resignation of Mr. Pyott who for many years acted as Chief Grain Grader and later as Chief Inspector.

The yields of crops of which an account is given by the Acting Chief Inspector of Grain, will be discussed in this report under the heading "Crops".

1,549,680 bags of maize grain and 975,603 bags of maize meal for export were graded by this Division during the year. The chief feature of the export of maize during the last four years has been the largely increasing amounts of meal, the milling of which has been of considerable benefit to the country. It remains to be seen, however, whether this trade will be continued now the war is over.

157,689 bags of oats were exported in the past year. The buyers oversea expressed a desire to purchase on graders' certificates, and after consideration of the subject at the Annual Maize Conference grading was decided upon. Owing to the difference in the type and character of the oats grown in the High Veld and in the Western Province respectively, two classes were established, with three grades in each.

Inland grading which was tentatively instituted at the request of the trade was continued but it was beset with difficulties and in many cases failed to satisfy either buyer or seller, nor is any great improvement likely until elevators are erected, and it is questionable whether under present conditions it should be continued.

At the Annual Maize Conference support was given to the continuance of the present grades for maize, and a prolongation of the inland grading system which as stated above is still upon its trial was asked for, and other useful resolutions were carried. These Conferences, which have been held annually since the export of maize was commenced, are of great value in keeping the Department in touch with the needs of the farmer and of the merchant, and in enabling representatives of farming and co-operative and commercial associations to discuss matters affecting their interests with officers of the Railway and Agricultural Departments.

GRAIN ELEVATORS.

The introduction of the long and much discussed system of grain elevators has been advanced a stage further by the appointment of an expert to report on the location and design of the elevators needed.

BRANDS, FENCING AND DIPPING TANKS.

Brands.—The Acting Registrar of Brands reports that 550 brands were registered in Transvaal during the year, 89 in the Cape and 31 in the Orange Free State and that 669 branding irons were supplied during the year for cash, in accordance with the practice in vogue in Transvaal whereby branding irons are made for farmers through the medium of a contract with an approved firm of blacksmiths in order to ensure their being properly made and supplied at a reasonable price; a proceeding which costs the State nothing and is greatly appreciated by the farmers.

There are now 20,900 brands registered in Transvaal, 5,736 in the Cape and 1,560 in the Orange Free State. The lack of a Brands Act in Natal and the necessity for the improvement of the Cape and O.F.S. Acts are much felt and as stated in my last report an Act for the Union is badly needed.

A Bill for the Union based upon the Transvaal Act, which is the most workable of the Colonial Acts, was drafted in 1917 but unfortunately Parliament has not yet been able to deal with it. Before its preparation steps were taken to ascertain from the chief cattle raising countries of the world whether any improvements could be effected in it particularly in the direction of avoiding or reducing the damage caused to hides by fire brands on the thighs of cattle, but no helpful suggestions were received. A number of experiments in branding were also conducted at the Potchefstroom School of Agriculture but mostly with negative results. From further inquiries made last year it appears that one of the Australian States is experimenting with a system which it is thought may prove less injurious to the hide and as effective as the old method. The experiments are being watched and if successful will be repeated here.

Fencing.—42 Applications for advances under the Fencing Act were dealt with as compared with 44 in the previous year. These numbers are but a fraction of those of previous years owing mainly to the continued high cost of fencing materials.

In the hope of being able to procure wire for the use of the farmers Sir William Hoy, who visited Europe shortly after the termination of hostilities to purchase material for the railways, was requested to inquire into the possibility of obtaining some of the huge stocks of barbed wire in the possession of the military authorities, but on inspection he found that it was quite unsuitable for our purposes as it was not galvanized and for other reasons.

Dipping Tanks.—108 Applications for advances for the construction of dipping tanks were received compared with 133 for 1917-'18 and 247 for 1916-'17. The numbers of cattle dipping tanks erected in the corresponding periods were 535 in 1918-'19, 730 in 1917-'18 and 1,239 in 1916-'17. The falling off is regrettable though there is little doubt it was caused by the scarcity of cement rather than inertia on the part of the farmers.

IMPORTS AND EXPORTS.

Owing to the difficulty of obtaining freight in the past two years, and to the preference naturally given to necessaries, the export and import trade for the calendar year 1918 cannot be considered as normal, or as giving a correct index to the natural expansion in agriculture during that period.

In my report last year I traced the growth of the export trade and the decrease in the import trade in agricultural produce since 1898. The development there recorded has been well maintained: as seen below, the excess in value of exports over imports has increased by £2,362,841, and the importation of articles of food except condensed milk (which it is hoped will soon be manufactured here) and wheat and rice is fast disappearing:—

	1917.	1918.
Exports (excluding Ostrich Feathers) ..	£15,906,365	£17,760,855
Imports	3,135,240	2,626,889
	£12,771,125	£15,133,966

In the export of animal products the progress made in the last decade was barely maintained. A falling off occurred in the quantity of wool, skins, hides, beef, butter and eggs, mainly through the lack of shipping, although on the other hand, encouraging increases occurred in the quantity of bacon and cheese. References to the Meat Export will be found in my Report on the Veterinary Division, and to the export of maize, maize meal and tobacco in the reports on the Divisions concerned.

A much larger quantity than usual of mohair was shipped but this was chiefly due to the amount held over from the previous year.

Wheat and flour were difficult to obtain and in consequence the quantity of them imported was much reduced, and to tide over the shortage created thereby an Act was passed making it compulsory to dilute wheat flour with a certain proportion of maize meal or other substitute. As a result of the shortage, wheat growing in South Africa received a considerable stimulus and increased quantities were grown.

As was to be expected much difficulty was experienced in obtaining supplies of all kinds of farm requisites. This has greatly inconvenienced farmers, and to a large extent has retarded progress, but if the shortage and high prices of farm implements have induced them to bestow greater care on these articles the trouble has not been without its good effect.

Though farmers in South Africa have suffered during the war through the difficulty of obtaining supplies of farm requisites such as fencing and dipping materials and bags and fertilisers, they have on the other hand reaped much gain by the high prices obtained by selling their goods oversea. If the 1913 price is applied to the quantities of agricultural produce exported during the years 1914 to 1919 the magnitude of this gain is manifest. The prices actually obtained during these years exceeded by £31,000,000 the amount which would have been received during this period had the 1913 price remained throughout. During the years 1914 and 1915 the prices obtained were not quite so good as in 1913, but from 1916 onwards the value was enhanced, until in 1919 the increase on the 1913 basis on the agricultural produce exported, amounted to £15,500,000.

WEATHER.

The past year fortunately was not marked by any extreme and severe climate conditions and though serious damage was done in all Provinces by hail and rain storms and dry times were experienced over short periods, the weather on the whole may be considered to have been satisfactory.

In the winter rainfall areas in the month of August there was a somewhat severe spell of dry weather but this was followed by satisfactory rains in September and October and though crops were impaired no very great loss was suffered.

In the summer rainfall areas though the opening and closing months of the year were dry the rainfall was sufficient in amount and seasonal distribution, and exhibited only normal deviations. Heavy storms were experienced in February, and at Zoutpansberg on the 18th the gauge overflowed and of the total precipitation only ten inches were recorded.

Serious damage was caused by hailstorms in various districts in September, November, December, January and February and trees and crops were destroyed and in some cases sheep and goats and poultry were killed, and it would obviously be to the benefit of small farmers and settlers if some form of co-operative insurance were entered into.

Details will be found in the report of the Meteorologist in the Appendices.

ADULTERATION OF WINE, SPIRITS AND VINEGAR.

The administration of Act 15 of 1913 providing against the adulteration of alcoholic liquors and vinegar, which was vested in this Department, reveals that there is much still unsatisfactory in the wine and spirit trade. During the five years in which this Act has been in force, analyses of samples of brandy have shown that the tendency to adulterate this spirit is increasing, and for the past year 25·9 per cent. of the 305 samples analysed were found to be not up to the standard provided by the regulations. With whisky also there is a similar disposition though not so marked, for of 88 samples analysed during the past year 13·6 per cent. were not up to standard. In wine the result was somewhat better, though again the result for the past year is worse than in any of the previous four years.

With this unfortunate disposition so evident in these trades, it is gratifying to find that the vinegar trade on the other hand is continually improving, and during the last year only 7·4 per cent. of the 67 samples analysed were rejected for not complying with the regulations.

A brief account of the proceedings taken under the Act is included in the Appendices to this report.

LEGISLATION.

A Bill to consider and bring up to date the legislation relating to the Branding of Livestock, to Co-operation, and another to amend certain portions of the Diseases of Stock Act were drafted for submission to Parliament, but unfortunately owing to pressure of business they were crowded out.

Since Union the whole of the Acts dealing with agriculture formerly in force in the various Colonies with the exception of those relating to the two subjects aforesaid have been consolidated and brought up to date and there are now 18 Acts in the Statute Book dealing with agriculture that have been drafted at the instigation of the Department and a number of others that have been prepared by the Lands, Irrigation and Forestry and other Departments and though a few other Acts are still required the Union is on the whole well equipped with fundamental legislation relating to agriculture. As an indication of the amount of work involved in the drafting of some of the Acts, for which we have to thank the Legal Adviser, it may be stated that the Diseases of Stock Act consolidated and repealed no less than 36 Acts, and the Agricultural Pests Act 10 Acts.

CROP AND LIVESTOCK REPORTS.

The Monthly Crop and Livestock Reports, introduced in 1915, provide information on crop and livestock prospects and give estimates of crop yields. Though proving of great value they have not been entirely successful, owing largely to the lack of officers to interest and advise farmers ond other voluntary reporters who supply local data to the Department. The reliability and completeness of the reports depends on the efforts of these voluntary workers and it is desirable, therefore, as I recommended last year that paid agents be appointed in different parts of the country to assist them and to supervise their work, and act as local intelligence officers of the Department. Even in their present form the reports disseminate much valuable information, but if the reporting agencies were strengthened in the manner suggested, the reports would tend to become much more detailed and complete and would also furnish a more reliable guide to the crop prospects of the country as a whole.

CROPS.

Despite the improvement made in the cultivation of certain crops in South Africa, the yield of the staple ones is deplorably low, and lower, as I have pointed out on several occasions, than those of any other country of any agricultural pretensions in the world; and according to the census the yield of some of them is decreasing. Though this decrease is due partly to shortage of fertilisers and to the adverse weather conditions experienced in the 1917-18 season when the census was taken, it cannot be said that the systems of farming practised are yet of very high standard, and little attempt is made to maintain the fertility of the soil.

Maize.—According to the census of 1918, South Africa produced 9,712,610 muids on 4,420,936 acres with an average yield of 2·19 muids per acre. The yield is lamentably low, and very much lower than that of other maize producing countries. In 1918 the United States of America produced 723,187,920 muids on 107,494,000 acres of land, and the average yield per acre was 6·72 muids, The leading maize producing district in each Province in South Africa, viz., Kroonstad in the O.F.S., Potchefstroom in the Transvaal, and Estcourt in Natal, produced respectively yields of 3·03 muids, 2·69 muids and 2·90 muids per acre, whilst Illinois and Iowa, the two largest producers in the United States, yielded 9·94 and 10·08 muids, respectively. The Argentine in the same year produced 47,784,000 muids on 8,715,000 acres with an average yield of 5·488 muids per acre.

The area under maize in South Africa in 1918 was nearly twice as large as that devoted to the crop in 1910-11. It is feared, however, that the improvement in method has not kept pace with the extension in area, for according to the census the yield per acre in 1918 was no better than that given in the previous census.

Kaffir Corn.—According to the census 233,105 acres are now devoted to this crop and the acreage has been increased by nearly 40 per cent. since 1911, and it now stands fifth among the crops. Originally grown in this country, it was taken to America where it was developed to a remarkable extent. It is more suited than maize to the drier areas with shorter growing seasons, and when more bird-resistent varieties are discovered it will no doubt gain in South Africa greater popularity.

Potatoes.—The area under this crop has increased since the previous census by 79 per cent. and now reaches 110,185 acres. It was generally believed that potato seed grown for several years in this country would deteriorate. During the war very little potato seed was imported, but so far there is little evidence to indicate that any deterioration in the quality of the seed has taken place.

Crops for Fodder and for the Amelioration of Soils.—Of the many encouraging features to be observed in South Africa farming not the least is the greater attention being paid to the production of fodder crops. Lucerne, Teff, Kikuyu, Vetches, Peas and Beans, Velvet Beans and Cow Peas, Sudan Grass, Elephant Grass, Paspalum, Phalaris and various native grasses such as Rhodes Grass are now taking definite places in the cropping system. All of them are furnishing reliable food for the feeding of stock, and those belonging to the Leguminoseae are adding plant food to the soil; and the increase in their cultivation is a notable sign of the advent of better farming.

Teff Grass.—(Eragrostis Abyssinica) which was obtained from Abyssinia by the Transvaal Division of Botany has become firmly established in a remarkably short time and is now extensively grown in the High Veld. It makes the best of hay and is cheaply and easily grown. The introduction of it (which is referred to in my report on the Division of Botany) has probably been worth more to the country than the total outlay upon the Division of Botany since its inception. It is assisting greatly in the development of dairying, and during the drought has been a great boon. According to the last census, the area devoted to it is 234,343 acres, and is twice as large as the area under lucerne. The crop now stands fourth in order of acreage and the yield is 1,763 lbs. per acre according to the census.

Kikuyu Grass, introduced by the Department from East Africa about three years ago, is now fairly well established as a grazing and lawn grass, and is increasing in favour owing to its vigorous growth and to its character of withstanding, and in fact being benefited by, heavy grazing.

Sudan Grass is now being largely cultivated and to some extent it is replacing teff owing to its strong growing habit and heavier yields and drought resisting character.

Vetches are taking a permanent place in the rotations in the grain areas of the Western Province of the Cape and this is much to the benefit of the soil which, owing to the method of cropping practised for the past hundred years in these areas, is greatly in need of improvement.

DEPARTMENTAL COMMITTEE ON WHEAT GROWING.

At the beginning of the year a Departmental Committee consisting of Mr. Alex. Holm, Under Secretary for Agriculture, Dr. C. F. Juritz, M.A., F.I.C., Agricultural Research Chemist, Mr. H. S. du Toit, Dry-Land Agronomist, with Mr. H. Wolfe, M.Sc.Agr., Technical Assistant as Secretary, and the first named as Chairman, was appointed to inquire into and report upon wheat growing in the Union and to give such information and advice thereon as might be helpful to wheat growers.

Evidence was submitted by farmers in all wheat growing centres on the prevailing climatic conditions, the system of farming practised, the yield of wheat and cost of growing it and the possibilities of extending the area under it; by millers on the suitability of South African Wheats for production of flour for bread making; and by implement dealers on the supply of agricultural implements.

The inquiry revealed little evidence of the possibility of extending the area under wheat and no data concerning any hitherto unpractised or uncommon system except that of the growing of vetches with or without oats in a rotation, combined with spring or summer ploughing. This system, advocated by an officer of the Department at the Grain Conference at Elsenburg in 1915, has been in the hands of Mr. Chas. Leonard, of Gloria, a means to a most remarkable improvement in yield, of which evidence will be found on pp. 9, 50 and 51 of the report.

The cultivation of vetches has so far not been practised to any extent owing to the difficulty of obtaining seed and to the fear that it might become a pest, as a result of the mistaken opinion generally held that it is identical with a well-known troublesome weed.

There is no truth more plain than that the wheat growing soils of the South-West areas are virtually exhausted and that the present day yields of wheat from them are largely dependent on the annual application of fertilisers, and the discovery of some system of husbandry which will remedy this state of affairs and of varieties of wheat which can successfully be grown outside these areas to which it is now practically confined are two of the most pressing problems confronting agricultural research to-day.

LIVESTOCK.

According to the last census there were in the Union 6,851,924 cattle, 29,914,035 sheep, 8,018,871 goats, 781,022 horses, 84,559 mules, 554,316 donkeys, 1,043,224 pigs and 9,420,645 poultry.

The value of the livestock is placed at £100,000,000.

7,004 head of pedigree cattle valued at £342,756, 23,861 head of stud sheep valued at £191,401, and 364 pigs valued at £3,886 have been imported since Union, those from the United Kingdom and required for breeding purposes, being brought in freight free, and it is estimated there are 10,000 well bred bulls now in use in the country.

Cattle, horses and donkeys show a moderate but not striking increase in numbers since the previous census, but sheep and goats which have not yet recovered from the drought of 1914 were slightly less and the number of mules and pigs has decreased. The decrease in the number of pigs in view of the interest manifested in them in the last few years is surprising. During the war the price obtainable for well bred and well fed pigs has constantly increased, and should have been an incentive to farmers to undertake the breeding of them in larger numbers.

Though the increase in the number of livestock has, perhaps, not been so great as one would have liked to see it, the deficiency is to a certain extend atoned for by the improvement that has been made in livestock of recent years, particularly cattle, sheep and poultry, and whereas a few years ago there were only two or three breeds in the country and little attention had been given to improving them, there are now large numbers of really first-class animals of nearly all the leading breeds including the Afrikander in it, so good in fact that considerable trouble is experienced by the leading breeders in obtaining new blood of sufficient merit to improve their flocks and herds: and though some of the animals may yet be improved in respect to show points the best of them are good enough for commercial purposes. The general level of the stock of the country has also undoubtedly improved, but as was to be expected, in far less proportion than the best and what is wanted now, probably, more than anything else is the further raising of the standard of the general stock of the country which will have to be accomplished by the exercising of more care in breeding and also better management, for the standard of animal husbandry throughout the country is still low and the number of deaths annually from preventable disease and from drought is still very great; and if the livestock industry is to progress as it ought to do far more care will have to be taken to provide food for the animals throughout the year by the growing of fodder crops and by the preservation of them so as to keep the animals going and improving from their birth onwards.

The need for improvement in quality and early maturity is particularly urgent with respect to cattle for beef and pigs for bacon for the production of animals suitable for these purposes at present is barely sufficient to maintain an export trade in meat, which is referred to in my report on the Veterinary Division.

Cattle belonging to natives, which as stated elsewhere, constitutes according to the census one-fourth of the livestock of the country, have so far not been improved, and some steps ought to be taken to raise the standard of them in order not only to make better use of the veld but to swell the volume of production of milk and beef.

The veld in many parts under the present conditions appears to be almost fully stocked and incapable of carrying a greater number of animals with any degree of security or margin to tide over the periods of drought that will inevitably recur. The carrying capacity of it, however, could by proper treatment be considerably increased, and more attention ought to be devoted to it.

POULTRY.

According to the census there are now 8,436,140 fowls, 495,271 ducks, 271,105 geese and 218,129 turkeys in the country. When compared with the previous census it is seen that the numbers are not increasing, but this defect though regrettable is atoned for to some extent, as in the case of other livestock referred to above, by the marked improvement made in the quality and management of the birds, and the best of them have now attained a very high standard indeed and excellent records have been made in the egg-laying competitions held at the Schools of Agriculture and at Rosebank.

The labours of the Lecturers in Poultry at the Schools of Agriculture and Experiment Stations, which are referred to in the report on Agricultural Education, have been attended with most gratifying results.

The reports received from overseas state with reference to our eggs that they are the best of any, except Irish, received on the London market. As with maize and some other products the grading of eggs for export has ensured that only those up to standard are placed on the oversea market, and this has, no doubt, assisted much in producing the good reputation already made.

In the calendar year 1918 owing to the impossibility of obtaining shipping space no eggs were forwarded, but several shipments have already been made in the current year, and it is expected that the quantity exported will reach seven or eight millions, which however as pointed out will average only one egg per fowl, whereas Ireland, a country not larger than Natal, exports eggs annually to the value of £6,300,000.

DEPARTMENTAL EXHIBIT AND INFORMATION BUREAU.

The exhibiting by the Department of the agricultural products of the country has hitherto been confined to the Departmental exhibit at the leading shows in South Africa, and to the forwarding to the Trades Commissioner in London from time to time of samples of them as required. The preparation of the exhibit and its despatch from show to show have in the past perforce been left to such enterprise and attention as staffing ond other arrangements permitted, and this has entailed lack of continuity and design, while the purely publicity work of the Department has been almost entirely neglected.

The increased interest in farming in South Africa, both here and abroad, the growing demand for land and the application to it of new capital from other countries, the movement towards closer settlement and the growing surplus of agricultural products required that greater attention be given to displaying both here and elsewhere examples of our products and to making known the facilities offered by the Department in the provision of advice and courses of instruction and in investigation of the various problems that still confront the farmer.

To ensure that this receive the attention it deserves, a special officer should be appointed to take charge of it. His attention would be devoted to supplying the Trades Commissioner with various articles in such form as required and best fitted to make an appeal to the imagination of the public, and to the preparation and exhibition of a bright, attractive, stimulating and vitalizing display at suitable centres and shows and other public functions in the country. His appointment would help to remove that suggestion of inactivity of the Department that is now some times evident in the impressions gained by regular visitors at our shows, and tend to ensure due recognition of the country's possibilities and make accessible to the public in an attractive form information on its resources.

VETERINARY COLLEGE.

The establishment of a College for the study of Veterinary Science which has been advocated for some time past, has been sanctioned by the Government and is being proceeded with. The College will be located at Onderstepoort and will form an integral part of the Transvaal University College at Pretoria and will constitute the Faculty of Veterinary Science in the University of South Africa. The Course will be a five years' one, the first two of which will be taken at any of the Universities or University Colleges possessing the necessary facilities, and the last three at Onderstepoort.

The teaching staff will be officers of the Department on the one hand and members of the Faculty of Veterinary Science in the University of South Africa on the other hand, and Sir Arnold Theiler who has kindly consented to prolong his stay in the Department in order to take charge of the school, will be Dean of it.

The association of the College with Onderstepoort will enable the students to profit by the immense amount of information and material accumulated by the Division of Veterinary Research and by the other resources at the disposal of the Division and to receive instruction from a much larger teaching staff than would be possible at a College apart from the Division, and what is also important, from men who are actively engaged in research; and the teaching that will be required will be beneficial to the research officers as it will help them to clarify their ideas and keep in touch with the literature of their subject as a whole.

The arrangement will be an economical one, for many of the buildings needed for the school are already in existence at Onderstepoort and can be used by it without impeding the work of the Division, and the greater portion of the material required for educational purposes is likewise available at Onderstepoort. It is true a number of additional buildings will be required, but they also will be used both by the school and by Onderstepoort and the majority of them would in any case be wanted for development. Further, should the number of students be small no waste will be incurred as the teachers will be appointed for research as well as for instruction and any time not occupied in the one will be devoted to the other.

The increase in the staff necessitated by the school will also benefit Onderstepoort by enabling its work to be distributed to better advantage.

To prepare for the College Sir Arnold Theiler and such of the staff of Onderstepoort who will be connected with it will proceed to Europe and the U.S.A. before it opens in order to familiarise themselves with the latest developments in Veterinary Education and to obtain what apparatus and other equipment may be required.

The school which it is hoped and firmly believed will be of the highest class, should prove of immense assistance to the country and besides affording young Africanders an opportunity of qualifying at home, it will enable them to obtain a far better insight into the diseases and conditions of the country than could possibly be obtained at any of the existing colleges abroad and it should also be useful for educating veterinary surgeons for the rest of Africa and for other warm countries like this, and for post-graduate study, and by the standard which it is confidently believed will be set, it should help to elevate agricultural education throughout the country.

F. B. SMITH,

Secretary for Agriculture.

FRIESLAND BULL "ADMIRAL BEATTY."

D.O.A. 46 P. (Vol. 9).

Bred at School of Agriculture and Experiment Farm, Potchefstroom, Winner of many Champion Prizes at leading Shows in South Africa. First bull to realise £1,000 in South Africa, and subsequently sold for £5,000, and finally sold by auction on September 14th, 1920, for £7,750.

MERINO (TASMANIAN) RAM "GLEN STAR."

Bred at the Glen School of Agriculture and Experiment Farm. Winner of Championship Prize, Johannesburg Show, 1919.

APPENDIX I.

VETERINARY DIVISION.

East Coast Fever.

In many parts of the Union this disease continues to monopolise the attention of our officers.

Generally speaking the situation has improved, but although this is the case the progress we have made is so slow and the set-backs we have experienced in certain areas are so serious that only an incorrigible optimist with youth on his side could regard the position with equanimity, and look forward to the time when the disease will be ultimately eradicated. In fact, one of our officers, whose time for many years past has been given up almost exclusively to the control and handling of East Coast Fever, after a considered review of the position appears disposed to think the most we can hope to do under present conditions is to control the disease until such time as the farming community are prepared to make greater sacrifices for the purpose of stamping it out than they are at present. With this view I am not inclined to agree entirely, as I believe that the slow progress which we are making in certain sections of the country is due to causes arising out of the War, which we may reasonably hope will be mitigated in the future. Of these causes I may mention the following:—

Cost of Fencing.—The prohibitive price of fencing material and the impossibility of obtaining adequate supplies during the past four years have deprived us of a most valuable weapon for checking the spread of East Coast Fever, by rendering the compulsory enclosure of infected areas impracticable.

The increased cost of dipping materials.—There is no doubt that, while the advance in price of arsenite of soda has not been such as to debar the progressive and well-to-do farmer from providing himself therewith, it has moved others who are less far-seeing to dip their stock in a more perfunctory manner than they would have done had it been cheaper, while it has been eagerly grasped by the non-progressive element of the farming community, which is not small, as an excellent reason for neglecting to dip their cattle at all.

To these two factors a third may be added, which during the past year has undoubtedly checked our progress, and that is the serious and widespread epidemic of Spanish influenza which occurred last October. During this epidemic dipping operations in many infected areas were suspended, and cattle strayed from infected areas through lack of herds, and in this manner fresh centres of disease were established.

These causes, together with a continued shortage of Veterinary staff, owing to the absence of officers on active service, have constituted, in my opinion, very serious obstacles to satisfactory progress which we may hope will be eliminated in the future, and with their disappearance we may expect to make more rapid progress towards our goal. At the same time I believe that unless stockowners as a body will do more than they are doing at present and combine more heartily with the Department to ensure the consistent carrying out of our policy, the task of stamping out East Coast Fever will not be speedily accomplished.

It is undoubtedly true that many progressive stockowners, who recognise and feel how seriously the cattle raising industry and the general welfare of the country are affected by the scourge are willing to submit to more rigorous restrictions to get rid of this pest, but these men are in many instances but a voice crying in the wilderness, and in their zeal they are sometimes more disposed to blame the Government when things go wrong than the inertia of their neighbours. This progressive minority continue to call out for fresh reforms and by their insistence in some instances more harm than good has resulted from the premature acceptance of their recommendations by the Department, on the assumption that no expensive machinery would be necessary to carry them into effect. It is all very well for a progressive few to clamour for "compulsory dipping" and "tick eradication," and while both are eminently desirable, the mere drawing up of a Government Notice directing owners to dip their stock at specified intervals does not insure the results anticipated, and if outbreaks of disease occur subsequently in such compulsory dipping areas the Government is then subjected to an amount of candid criticism at the hands of the supporters of such measures and others who probably failed to co-operate with them which is scarcely deserved, as it must be obvious to all that the provision of a staff of officers to enforce compulsory dipping in a district where the measure is inacceptable to the majority of residents is financially impracticable. Even if such a staff could be provided, "compulsory dipping" carried out at the interval prescribed elsewhere than in actively infected areas, while it undoubtedly leads to a speedy reduction in the number of blue ticks whose life history renders their destruction comparatively easy, it does not even if persevered with over a very long period eradicate the East Coast Fever ticks or do more than reduce their numbers to an extent which may render the early detection of outbreaks of East Coast Fever more difficult than they would be if the animals had not been dipped at all. This is a point which is often overlooked by the advocates of compulsory dipping though it is borne out by the actual experience of Mr. Joseph Baynes, one of the dipping pioneers of South Africa, who lost cattle on his farm from East Coast Fever after many years of persistent dipping carried out at longer intervals than those now adopted in dealing with outbreaks of East Coast Fever, and for this reason and until it can be clearly shown that the advocates of compulsory dipping in any area have a good working majority behind them, and the area is well provided with tanks and little supervising machinery is necessary, the ordering of compulsory dipping in such areas not only places the Government in a false position and exposes it to unfair attack if outbreaks follow, but it tends to convince sceptics that compulsory dipping is "no good," and it may even contribute towards the dissemination of disease if it becomes necessary in compulsory dipping areas to collect the cattle from several farms at one central tank for the purpose of dipping them. Some extreme enthusiasts in the gospel of dipping have even gone so far as to suggest that, seeing it has been conclusively demonstrated that by dipping any intelligent stockowner can combat East Coast Fever and that the restrictions are more embarrassing than the disease, the restrictions should be withdrawn and farmers be left to protect themselves by their tanks, but those who advocate this course have not only forgetten that there are many farmers who have not yet realised the benefits to be derived from dipping as evinced by the extreme scarcity of tanks in many parts of the Union, but they have not taken into account the large numbers of stock owned by natives who, although they are often willing enough to act in accordance with the recommendations of the local Native Commissioner, are incapable of mixing and testing their dips without European assistance.

Abandonment of our present policy would be immediately followed by disaster to those sections of the community to whom I have referred, and I very much doubt whether those who believe in dipping and are properly equipped to combat East Coast Fever would greatly appreciate the predicament in which they would find themselves placed through the constant re-infection of their farms by infected stock passing over them and the continued necessity for short interval dipping which this would involve.

The chief difficulties with which we have to contend in our contest with East Coast Fever, apart from that arising out of unauthorised movements of cattle from or through infected areas, are those which are due to the unfenced condition of farms and public roads, to the movement of stock for winter grazing, and to the universal practice of using cattle for transport purposes. If the latter custom were abandoned and some other form of transport came into general use the eradication of East Coas Fever would be an easier problem oo solve than it is, and I am inclined to think that in time to come some more radical step for limiting these movements will have to be taken than has hitherto been attempted, and it may become necessary to introduce a zone system under which movements of cattle for transport purposes will only be permitted within the boundaries of a more or less definite area.

Owing to the dearth of railway facilities it will be impossible to lay down any hard and fast rule regarding the dimensions of such zones, but it must be apparent to everyone that the extensive movements of trek cattle from point to point which take place at the present time, in spite of the obstacles placed in the way of such movements, must necessarily be attended by an amount of risk which would be greatly reduced by the adoption of a zone system and by the infliction of penalties upon stockowners moving tick-infested cattle along public roads or across private property. Many maintain that the presence of the native constitutes an insuperable obstacle to the eradication of East Coast Fever, but this is an opinion which I do not share, as experience has shown that although disease is often introduced into native areas by illicit movements and is sometimes difficult to eradicate, the average native responds fairly well to pressure judiciously applied by an official in whom he has confidence, and the present East Coast Fever position in Rhodesia and in Swaziland and in many parts of the Transkei shows that the task of dealing with outbreaks of disease in native areas is in many respects simpler than it is in districts occupied by a mixed population, where there is a constant demand for permits for the movement of cattle for transport and other purposes, and where a refusal does not necessarily suffice to prevent the movement taking place.

Cape Province.—During the year there has only been one outbreak of East Coast Fever in a native location in the Dongwe area, Kingwilliamstown, obviously an extension from a previously existing centre. This outbreak was promptly and vigorously dealt with. The disease was arrested by short-interval dipping under proper supervision, and as no deaths have occurred in this location since May, 1918, we have good reason to hope the outbreak has been suppressed, and when this quarantine is removed I hope the Cape will be entirely free from the disease.

Transvaal.—Seven districts are still infected with East Coast Fever. In the Barberton district deaths from East Coast Fever have occurred on eighteen farms during the year, eleven of which represent fresh outbreaks. In this district we have sustained a very serious set-back, which can only be attributed to illegal movements and to a deliberate attempt to conceal the existence of the disease, with the dismal result that the labour of years has been undone, to the disappointment of the progressive farmer and of the Department.

In Pietersburg deaths from East Coast Fever have been reported on fifteen farms, six of these having become infected during the year, but fortunately the fresh outbreaks have mostly occurred in the low-veld areas closely adjacent to the new centres discovered last year and mostly on farms which are already tanked.

In the Zoutpansberg district thirteen farms are actively infected, and five hundred deaths have been reported. The Piet Retief district has also been unfortunate, the number of infected farms having been increased by five fresh outbreaks, bringing the total number up to ten. Owing to the difficulty in arranging for the construction of a dipping tank on the farm Pipeklipberg, a very heavy mortality occurred before dipping operations were commenced. The bulk of the outbreaks in this district are confined to the South East corner and mainly to native herds.

In Carolina there have been deaths from East Coast Fever on two farms placed in quarantine during the previous year, but no fresh outbreaks have been located, and the position appears hopeful.

The disease appeared in the Ermelo district on the farm Lochiel, which adjoins an infected farm in the Carolina district, but so far there has only been one death.

In the Waterberg district the last quarantined farm was declared clean on 18th June, and we have had no further reports of any mortality elsewhere which would lead us to suspect the disease is smouldering in any other part of the district.

Natal.—In his report for the current year the Senior Veterinary Officer expresses the opinion that while we are perhaps holding our own, and even making some headway in this Province, the slowness with which we are progressing justifies a reconsideration of our policy in certain respects. He also dwells upon the need for an increase in our professional staff and the provision of motor transport in order to increase their efficiency and minimise delays in dealing with suspected outbreaks, and I hope now that the war is over the Government will see its way to strengthening the position of the Division in these directions.

The Senior Veterinary Officer also expresses the hope that further attempts will be made to discover a specific for this disease, which I consider is not beyond the bounds of possibility when we remember the satisfactory results which now follow the use of Trypan Blau in Redwater.

The work of providing dipping facilities for native stockowners is progressing steadily, but a good deal still remains to be done before it can be said that the position in this respect is satisfactory. It is somewhat remarkable that after so many years of preaching the gospel of dipping tanks the Senior Veterinary Officer should be compelled to state that "it is regrettable to find comparatively little progress made in many parts, and where in the absence of considerable official supervision the necessity of tick eradication as a safeguard against East Coast Fever does not appear to be fully realised."

The number of outbreaks, however, for the year is 195, as compared with 247 for the previous twelve months, so I think we may still look upon the situation as very far from desperate. Details of the distribution of these outbreaks will be found in the appended tabular return.

Transkei.—The progress made in combating East Coast Fever in native territory has exceeded my expectations, especially in those areas where adequate dipping facilities have been provided, and the natives are sufficiently progressive to appreciate the benefits to be derived from their use. Unfortunately, however, there are still areas in this Territory which are indifferently tanked and where the natives are antagonistic, and as these areas are in many instances coastal with a climate favourable to the propagation of insect life and diffcult of access, on account of the physical features of the country, a considerable interval must necessarily elapse before we can claim that the disease is well in hand.

The districts which are in the worst position are St. Johns, Bizana, and the lower portion of Umzimkulu. In the case of the Kentani, Willowvale, Elliotdale and Mquanduli districts, there has only been one outbreak in each, while six districts—namely, Xalanga, St. Marks, Tsomo, Nqamakwe, Libode and Mount Currie—are regarded as clean.

Much of the progress in combating this disease that has been made in Native Territory has been due to the efforts of the General Native Council, which has persevered with its programme of tank erection.

TUBERCULOSIS.

No further advance has been made in tackling this problem since I prepared my last report, but I sincerely hope that now, when our staff is returning to its normal proportions, and there is even some prospect of its expansion, this reproach will be removed from the Department, and steps will be taken to deal with this disease in a rational and more satisfactory manner than it has been handled in the past.

The passage of the Public Health Bill is a good omen, and, with the co-operation of the medical profession, public opinion may perhaps be awakened to the importance of the public health aspect of Tuberculosis in cattle. Quite apart from this, however, I am satisfied that if the average stockowner had any idea of the serious nature of this menace to his welfare he would insist upon more notice being taken of it.

Cape Province.—A considerable increase in the number of infected animals in the prohibited areas of the Cape Province, which have been detected by the application of the Tuberculin test, is reported by the Senior Veterinary Officer, Cape Town, the percentage having risen to 4·33 per cent. as compared with last year; and, while he is not inclined to regard this increase as indicative of a rapid spread of infection, but rather attributes it to the fact that one of the largest exporting dealers has been buying largely from infected dairy herds in and around Cape Town, I have no hesitation in saying that the position cannot have become any better during the past twelve months.

Transvaal.—Senior Veterinary Officer Spreull states "the apparent falling off of outbreaks shown in our table for this year is entirely misleading—twelve more valuable months have been lost."

Natal.—In Natal this disease was discovered on five properties, 2,713 head of cattle were tested, of which 83 reacted.

Orange Free State.—A test of the Ayrshire herd which had been in contact with the Ayrshire bull found to be affected last year, showed seven reactors, which the owner elected to have branded and isolated. Twenty-one cases of Tuberculosis were reported from the Johannesburg and Durban abattoirs, 14 cattle and 10 pigs. The usual attempts were made to trace the source of supply, but without success.

Transkei.—Two cases of Tuberculosis were found amongst cows which had come from Cape Town. In-contacts with these, to the number of fifteen, were tested, with the result that seven reacted and were destroyed. The periodical test of Mr. Gilson's herd revealed the presence of three reactors.

Imported Reactors.—During the year 360 imported cattle were tested at our quarantine stations in the Cape Province (Cape Town, Port Elizabeth and East London); twenty of these reacted to the test and were destroyed. Of this number the Department failed to demonstrate the existence of Tuberculosis in six animals and the owners were compensated in terms of the Act. 148 head of cattle (imported) were also tested at the Durban quarantine station, and by special arrangement at Maritzburg. Of this number 17 reacted and were slaughtered. The number of animals in which no visible lesions of the disease were found having been unusually high, in spite of the fact that the reactions were characteristic, enquiries were made oversea as to the probable cause, and it was suggested by one of the most responsible and reliable practitioners, who specialises in the testing of animals for oversea, that this was probably due to the fact that after animals had been tested and passed as healthy in Great Britain the serious delays which arose before the animals could be shipped exposed them to the risk of infection between the time they passed the test and the time they were shipped, and as a considerable number of those which were condemned and proved on post mortem to be tubercular showed recent lesions of inconsiderable extent, I am inclined to think this theory is probably correct.

As the testing station at Pirbright is now available for the reception and test of cattle coming out to this country, importers will now be able to have their animals tested officially before shipment and bring them out under conditions which will preclude the possibility of infection after test, an arrangement which will undoubtedly be welcome both to importers and the responsible officers of this Department, who are at present entrusted with this onerous and thankless duty of testing them on arrival.

ANTHRAX.

Senior Veterinary Officer Dixon, Cape Town, states "Anthrax is the most serious disease we have to contend with, and is responsible for more losses amongst farm stock than the total losses from all other contagious diseases." I do not think the statement is an exaggerated one, and it is a matter for regret that in spite of the repeated warnings which have appeared in the press and the pamphlets which have been issued from time to time by the Department, stockowners cannot be brought to realise the danger of skinning and cutting up the carcases of animals which have died suddenly without showing any preliminary signs of illness. There is only one safe way of dealing with these—by destruction by fire without opening them, or, alternatively where this is impracticable, by burying them intact with quicklime and fencing in the graves; but many are unable to resist the temptation of skinning such animals for the sake of the hides, and in this way the disease is spread and will continue to spread till the rearing of stock without biennial inoculation of all classes of farm animals will become an impossibility in areas particularly favourable for the perpetuation of infection.

In the Cape 103 outbreaks have been dealt with, in the course of which 12,325 head of stock have been inoculated. In the Transvaal we have investigated no fewer than 700 outbreaks, in the course of which 1,500 head of stock have died and 67,500 head have been inoculated. In Natal there have been 54 outbreaks, with 413 deaths and 17,813 in-contacts inoculated. In the Orange Free State 122 outbreaks have been confirmed, with 524 deaths amongst all classes of stock, and a total of 33,983 animals have been inoculated.

Government Veterinary Officer Goodall, Bloemfontein, comments on the disease at considerable length in his report, and submits the suggestions that compulsory inoculation of all farm stock should be enforced in areas in which the disease is prevalent, and that it might be worth while making experiments with the Eechhorn method of immunisation recently introduced and reported favourably upon in America.

Anthrax is also becoming increasingly prevalent in the Transkei, where there have been 125 outbreaks with 250 deaths and a total of 47,522 animals have been inoculated. These figures must, I think, convince everyone of the seriousness of our position so far as this disease is concerned, and unless stockowners will arouse themselves and give ear to the warnings and advice of the Department, I am certain we will find ourselves at a very serious disadvantage when we endeavour to place our wool and hides on the world's markets, as it is scarcely to be expected that other countries will be prepared to run the risk attendant upon the handling of products which may be contaminated with the germs of this disease.

GLANDERS.

The Glanders situation may be looked upon as generally satisfactory, as most owners now recognise the importance of this disease, and suspicious cases are reported to the authorities. Sixteen outbreaks were dealt with in the Cape Province, in the course of which 51 animals died or were destroyed, and 143 in-contacts were tested. In the Transvaal there were 8 outbreaks, with 13 deaths and 77 in-contacts tested. Natal sends in a "nil" return for this disease. In the Transkei there have been six outbreaks, with 9 deaths and 34 in-contacts; and in the Orange Free State five outbreaks, with 19 deaths and 118 in-contacts.

LUNGSICKNESS.

The Union is still free from Lungsickness, but this disease is exceedingly prevalent in the northern part of the Bechuanaland Protectorate, where something like 52,000 in-contacts have been inoculated and collected in numerous concentration camps. During the outbreak of Spanish influenza last October large numbers of these cattle strayed and many of them have not yet been found, so there is every likelihood that the scourge may be added to our other troubles at no distant date. For this reason I regret that the Government were unable to see its way to fall in with my suggestion that a Veterinary Officer should be lent to the Protectorate authorities to assist in combating the disease till such time as they could get assistance from oversea, as it must be evident to all that diseases of this description can be tackled quite as effectually and no less economically in another Territory than in our own.

EQUINE SCABIES—MANGE.

Outbreaks of this disease continue to occur in various parts of the Union, but none of them have been serious, and are confined in the main to equines which are not well looked after. There have been 67 outbreaks in the Cape, 71 in the Transvaal, one in Natal, 5 in the Transkei and one in the Orange Free State.

EPIZOOTIC LYMPHANGITIS

There have been 13 outbreaks of this disease in the Cape, all of which have occurred in the Humansdorp district. No cases have been reported from the other Provinces, and an adherence to the policy of slaughtering infected animals will, it is hoped, lead to the total eradication of this disease at no very distant date.

CONTAGIOUS ABORTION.

After due consideration the Regulations framed for dealing with this disease have been withdrawn, as the arrest of the disease by legislative measures has proved to be impracticable. From now on the Department will continue to advise those who consult it as to the steps they should take for protecting themselves and checking the spread of outbreaks, but the policy of imposing quarantines of practically indefinite duration upon owners in whose herds the disease was found has been discontinued. Experiments in inoculation, with a view to immunising breeding stock against this disease, are being continued. The disease is undoubtedly much more prevalent than we formerly had any reason to believe, not only amongst European but also amongst native stock, both in the Union and in other Territories adjacent thereto.

SWINE FEVER.

As far as we are aware this disease is at present confined to the Cape Province, where there have been 11 outbreaks during the past 12 months. One outbreak occurred in Paarl, another in Stellenbosch, the other nine were in Somerset East, in the flats between Cookhouse and Longhope. Authority was received for the slaughter of all visibly affected, and in-contacts, where this appeared necessary, and at the present the disease appears to have been practically stamped out, only one farm remaining under suspicion.

DOURINE.

During the year Senior Veterinary Officer Dixon and the Assistant Principal Veterinary Officer visited a number of the farms in the Herbert District where the disease had been prevalent in 1916, but failed to find any active cases of the disease, although losses on these farms were said to have been considerable. Specimens of blood from animals said to have recovered from the disease were sent to Canada for agglutination test purposes. Of these, two were negative, one positive, and the fourth was returned on suspicion. From information received from the South-West Protectorate it appears that a few outbreaks of Dourine have been located on farms in the district.

RINDERPEST.

The Rinderpest Commission, to which reference was made in last year's report, completed its operations and established an immune belt of cattle in a stretch of country extending from Lake Nyasa to Lake Tanganyika, by the inoculation of approximately one hundred thousand head of cattle, with an all round average mortality of not more than five per cent. As this number included the deaths occurring in a stretch of country in the vicinity of Lake Tanganyika, where the cattle proved to be susceptible to Redwater, and where large numbers died of mixed infection following the use of Rinderpest blood containing the germs of Redwater, the results may be regarded as very satisfactory when allowance is made for the conditions under which the work had to be carried out. Some of the members of the Commission narrowly escaped capture by von Lettow's forces, when that body invaded Rhodesia shortly before its surrender; and as von Lettow carried a large number of cattle through the immune belt, some of which subsequently developed Rinderpest after entering Rhodesian territory, it is a matter for congratulation that members of the Commission present at the time of the surrender were able to deal with the situation which arose out of the introduction of these infected animals in such a manner as to stamp out the disease before it could spread any further, otherwise all the work of the Commission and the amount of money expended in the establishment of the immune belt would have gone for nothing. The Commission has now been withdrawn, but patrols are being continued along the Northern border of Nyasaland and Rhodesia, and the latest reports as to the position are entirely satisfactory.

NON-PROCLAIMED DISEASES.

In the Cape, Lamziekte has been prevalent on the sour veld areas, which did not enjoy good summer rains. A large number of milch cows succumbed to this disease in the Maclear and Elliot Districts during December, January and February. Horsesickness and Blue Tongue were practically absent, but in the Border Districts there was a considerable mortality amongst small stock from internal parasites after the wet summer of 1918. In the Transvaal, Quarter Evil has been particularly prevalent and has been a cause of heavy loss, especially in native locations. Stock Inspectors and Cattle Guards have been extensively employed in inoculating stock against this disease.

During the year 669 mules have been inoculated against horsesickness by our officers, with a total loss of three animals. In the Orange Free State, Blue Tongue was mild and not very prevalent, 41,112 doses of Blue Tongue Vaccine were issued by the Senior Veterinary Officer. Sixteen reports were received of the results of inoculation, from which it appeared that the inoculation of 18,616 sheep was attended by a total mortality of 49. All owners reported that animals were visibly ill after inoculation. White Liver: Senior Veterinary Officer Goodall expresses a hope that this disease will be thoroughly investigated. His present opinion is that the disease is induced by the ingestion of some plant. Anaplasmosis has been fairly prevalent in the Orange Free State, and the gross character of the tick infection existing on many farms in the Orange Free State, and the consequent need of dipping tanks, is commented upon by our officers, but up to the present comparatively few tanks have been erected.

Owing to the prevalence of wire-worm, the demand for the Government wire-worm remedy continues to increase, 715,000 doses have been distributed from Bloemfontein, and favourable reports as to its effects have been received from all quarters.

MEAT EXPORT.

The prospects of an expansion of our meat export trade are encouraging, although the average quality of the meat killed for purposes of export leaves something to be desired on account of defective conformation of the animals, and we are probably placed at a considerable disadvantage through a lack of exact knowledge of the requirements of oversea buyers, though we are gradually improving our methods. At the moment a shortage of really efficient insulated trucks handicaps those killing up-country for export purposes. Nothing has yet been done in the direction of sending an officer oversea to study the meat export problem, and unless this is attended to soon there is a danger that our reputation may suffer through the export of food products being unsuitably packed or cured.

STAFF.

I am glad to say the professional officers of this Division who have been engaged on military duty are now returning to the Department, and I hope that before long the gaps which exist in our personnel may soon be filled. During the Influenza Epidemic of October many of our officers assisted the medical authorities to the best of their ability in carrying out protective inoculation and in dealing with cases of this disease. Many of the staff suffered from it, and I regret to say that one officer—Government Veterinary Officer Marais, of Volksrust—died from double pneumonia contracted as a result of his devotion to this self-imposed duty.

I have much pleasure in testifying once more to the zealous support accorded me by the Assistant Principal Veterinary Officer, the professional and clerical staffs of the Division generally, and to the assistance I have received from the Police, Magistrates, and officers of the Native Affairs Departments, who have contributed so materially to the successful prosecution of the work of the Division.

I append the usual returns.

C. E. GRAY,
Principal Veterinary Officer.

PROFESSIONAL STAFF OF VETERINARY DIVISION, 1918—19.

Cape Province.—Senior Veterinary Officer (Cape Town) R. W. Dixon; Government Veterinary Officers: W. A. Dykins (Cape Town), E. Fern (Cape Town), W. P. Hamlyn (Komgha), G. T. Henderson (Elliot), A. C. Kirkpatrick (East London), J. H. L. Lyons (Port Elizabeth), A. Matthew (Bedford), J. Nicol (Kingwilliamstown), W. A. Simson (Queenstown), H. H. Curson (Cape Town).

Orange Free State.—Senior Veterinary Officer (Bloemfontein) A. Grist; Government Veterinary Officers: A. Goodall (Bloemfontein), F. M. Skues (Bethlehem), J. F. Joyce (Kroonstad), W. Jones (Frankfort), A. McNae (on Active Service).

Transkei.—Senior Veterinary Officer (Umtata) G. W. Freer; Government Veterinary Officers: R. Paine (Kokstad), B. van der Vijver (Umtata), E. C. Nelson (Umtata), J. J. G. Keppel (on Active Service), G. H. Melck (on Active Service), A. M. Howie (on Active Service).

Natal.—Senior Veterinary Officer (Pietermaritzburg) W. M. Power; Government Veterinary Officers: S. H. Ewing (Eshowe), C. Tyler (Port Shepstone), J. L. Webb (Ixopo), C. H. Wadlow (Pietermaritzburg), A. F. Harber (Mooi River), F. Hutchinson (Dundee), B. J. Brummer (Vrijheid), J. Chalmers (Durban), J. R. Hamilton (Durban).

Transvaal.—Senior Veterinary Officer (Pretoria) J. Spreull; Government Veterinary Officers: J. G. Bush (on Active Service), F. J. Dunning (on Active Service), G. W. Lee (on Active Service), G. McCall (on Active Service), H. M. Webb (on Active Service), G. C. Webster (on Active Service), P. Conacher (Johannesburg), J. I. Edgar (Pietersburg), R. S. Garraway (Pretoria), G. May (Carolina), G. F. Marais (Volksrust, died November 1918), F. W. Hill (Mafeking), E. T. Clemow (Barberton).

Return of Cattle Dipping Tanks.—March 31, 1918, Cape, 1,469; Transvaal, 1,166; Natal, 4,245; Transkei, 729; O.F.S., 203.

March 31, 1919, Cape, 1,591; Transvaal, 1,312; Natal, 4,389; Transkei, 757; O.F.S., 219.

ANNEXURE B.—RETURN OF LIVESTOCK IMPORTED INTO THE UNION FROM OVERSEA THROUGH THE PORTS OF CAPE TOWN, PORT ELIZABETH, EAST LONDON AND DURBAN DURING THE YEAR ENDED 31ST MARCH, 1919.

Port of Entry.	Cattle.	Horses.	Rabbits.	Donkeys.	Sheep & Goats.	Pigs.	Dogs.	Cats.	Zoological Specimens.
Cape Town	410	135	1	18	15	6	13	—	Monkeys 5
Port Elizabeth ..	41	—	—	—	—	—	2	—	—
East London ..	53	—	—	—	—	—	2	—	—
Durban	148	42	—	—	275	285	10	—	—
Total ..	652	177	1	18	290	291	27	—	5

Return of Imported Animals Tested during the year ended 31st March, 1919.—Imported from Great Britain, 652; tested, 533; reacted and condemned, 37; percentage, 6.9.

NOTE.—Out of the 652 cattle imported, only 483 were tested during the year under review, the balance of 169 being accounted for as follows: 156 proceeded direct to Rhodesia, 5 proceeded direct to Onderstepoort, Pretoria and 8, which were landed in March, 1919, were tested in April, 1919. In addition to the above, 50 cattle which were landed in March, 1918, were tested in April, 1918, thus making a total of 533 cattle tested during the year, ended 31st March, 1919.

STATEMENT SHOWING THE BREED AND SEX OF ANIMALS IMPORTED FROM OVERSEA, 1918—19.

Horses: Thoroughbred, 43 Stallions, 68 Mares, 22 Geldings; Clydesdales, 1 Stallion, 1 Mare; Unknown, 7 Stallions, 26 Mares, 9 Geldings; Total, 51 Stallions, 95 Mares, 31 Geldings.

Pigs: Berkshire, 3 Boars, 4 Sows; Large Black, 1 Boar, 2 Sows; Slaughter, 281; Total, 4 Boars, 6 Sows, 281 Slaughter.

Donkeys: Catalonian, 16 Jacks, 2 Jennies.

Cattle: South Devon, 4 Males, 3 Females; Red Polled, 4 Males, 1 Female; Hereford, 36 Males, 75 Females; Lincoln Red, 4 Males, 1 Female; Aberdeen Angus, 55 Males, 199 Females; Ayrshire, 8 Males, 3 Females; Shorthorn, 56 Males, 189 Females; Sussex, 3 Males, 9 Females; Galway, 1 Male, 1 Female; Total, 171 Males, 481 Females.

Sheep: Merino, 58 Rams, 168 Ewes; Shropshire, 4 Rams, 2 Ewes; Romney, 1 Ram, 42 Ewes; Wanganella, 2 Rams, 12 Ewes; Border, Leicester, 1 Ram; Total, 66 Rams, 224 Ewes.

EXPORT OF BEEF.

During the year 58,011 carcases, as compared with 104,282 during 1917—18, were inspected for export, distributed amongst the various centres as follows:—

1918—19: Durban, 25,219; Johannesburg, 12,646; Cape Town, 8,960; Pretoria, 3,911; Pietermaritzburg, 5,152; Germiston, 1,875; Port Elizabeth, 39; Bloemfontein, 209; Total, 58,011.

1917—18: Durban, 36,249; Johannesburg, 24,994; Cape Town, 15,252; Pretoria, 11,644; Pietermaritzburg, 9,731; Germiston, 3,900; Port Elizabeth, 1,337; Bloemfontein, 1,175; Total, 104,282.

Quarters Shipped.—1918—19: Ex Durban, 159,225; ex Cape Town, 42,586; Total, 201,811.

1917—18: Ex Durban, 254,841; ex Cape Town, 24,244; Total, 279,085.

The decrease in the number of carcases presented for inspection during the past year is not due to shortage of cattle but to shortage of freight.

LEGAL PROCEEDINGS.

During the year legal proceedings were instituted by the Officers of this Division in 1,995 cases, resulting in the imposition of fines to the amount of £4,244 5s. 0d., and were divided among the various Provinces of the Union as follows:—

Prosecutions.—Natal, 833; Orange Free State, Nil; Cape, 307; Transvaal, 186; Transkei, 669; Total, 1,995.

Fines.—Natal, £1,991 10s. 0d.; Orange Free State, Nil; Cape, £926, 15s. 0d.; Transvaal, £356 5s. 0d.; Transkei, £989 15s. 0d.; Total, £4,264 5s. 0d.

IMPORTATION OF SLAUGHTER CATTLE FROM ADJOINING TERRITORIES.

During the year slaughter stock was introduced into the Union from the various adjoining Territories as follows:—

From Rhodesia (1) *via* Mafeking, 9,065, (2) *via* Messina, 4,152; from Bechuanaland Protectorate, 17,117; from South West Protectorate, 2,276; from Swaziland, 1,693; Total, 34,303.

BREEDING STOCK IMPORTED FROM BECHUANALAND PROTECTORATE.

Via Mooigenoeg Port of Entry, 5,469; *via* Ramathlabama Port of Entry, 8,120; Total, 13,589.

GENERAL.

Rhodesia.—Early in the year, in order to assist stock breeders in Rhodesia, an arrangement was come to between the Rhodesian and Union Governments whereby Liebig's Drift was declared a Port of Entry into Rhodesia for

(*a*) cattle entered in a South African Stud Book, and

(*b*) cattle imported from Great Britain and Ireland, the United States of America and the Kingdom of the Netherlands

on condition such cattle are imported through the port of Cape Town and are there subjected to and pass the tuberculin test.

Swaziland.—Mahamba was declared an additional Port of Entry for stock into the Union from Swaziland, to enable slaughter cattle to be forwarded *via* Moolman's Siding to the Pretoria and Johannesburg Abattoirs.

Rabies.—Owing to the prevalence of rabies in Great Britain, it was deemed necessary to publish more stringent regulations in respect of the introduction into the Union of dogs therefrom. All such dogs must now be accompanied by a health certificate and are subjected to 56 days' quarantine on landing in the Union.

Comparative Return of Outbreaks of Proclaimed Diseases. 1917-18 and 1918-19.

Disease.	Cape.		Transvaal.		Natal.		Transkei.		Orange Free State.	
	1917 1918	1918 1919	1917 1918	1918 1919	1917 1918	1918 1919	1917 1918	1918 1919	1917 1918	1918 1919
East Coast Fever	4	1	27	29	84	73	[See detailed return]		—	—
Tuberculosis :										
Outbreaks	—	—	21	3	8	5	—	2	1	1
Isolated, died or destroyed	111	237	67	5	27	83	—	9	1	7
In-contacts tested	6,139	5,474	501	59	1,463	2,713	—	15	1	147
Anthrax :										
Outbreaks	115	103	602	700	42	51	94	125	103	112
Died	221	194	836	1,500	176	413	151	250	901	524
In-contacts dealt with ..	2,148	12,235	598,601	67,600	12,592	17,813	41,011	47,522	23,489	33,983
Glanders :										
Outbreaks	15	16	13	8	1	—	1	6	4	5
Died or destroyed	68	51	42	13	1	—	1	9	10	19
In-contacts tested	587	143	183	77	4	1	1	34	139	118
Lungsickness :										
Outbreaks	—	—	—	—	—	—	—	—	—	—
Died or destroyed	—	—	—	—	—	—	—	—	—	—
In-contacts dealt with ..	—	—	—	—	—	—	—	—	—	—
Equine Scabies :										
Outbreaks	87	67	77	71	5	1	4	5	—	1
Died or destroyed	27	7	7	2	3	—	5	—	—	—
Under observation or treated	233	136	124	107	4	4	5	5	—	—
Epizootic Lymphangitis :										
Outbreaks	6	13	—	—	5	—	—	—	—	—
Died or destroyed	7	18	—	—	6	—	—	—	—	—
Treated	52	—	—	—	6	—	—	—	—	—
Contagious Abortion :										
Outbreaks	2	4	24	22	23	21	5	14	7	9
Infected	10	18	74	71	107	90	5	—	67	95
Trypanosomiasis :										
Outbreaks	—	—	—	—	—	—	—	—	—	—
Infected	—	—	—	—	—	—	—	—	—	—
Swine Fever :										
Outbreaks	10	11	—	—	—	—	—	—	—	—
Died or destroyed	377	961	—	—	—	—	—	—	—	—
Animals Quarantined ..	616	2,022	—	—	—	—	—	—	—	—
Dourine :										
Outbreaks	—	2	—	—	—	—	—	—	—	—
Died or destroyed	—	3	—	—	—	—	—	—	—	—
Contacts dealt with ..	—	285	—	—	—	—	—	—	—	—

ANNEXURE F.—EAST COAST FEVER.

District.	No. of Farms in Quarantine on which cases have occurred during 15 months end to of March.		No. of Fresh Outbreaks		No. of Farms released from Quarantine		No. of Farms cleared by Slaughter		No. of Farms where Fencing has been ordered		No. of Cattle Dipping Tanks in Commission	
	1917–18	1918–19	1917–18	1918–19	1917–18	1918–19	1917–18	1918–19	1917–18	1918–19	1917–18	1918–19
CAPE :—												
Komgha	nil	nil	nil	nil	2	nil	nil	nil	nil	nil	—	192
King Williamstown ..	4	5	4	1	nil	“	,,	,,	,,	,,	—	107
NATAL :—												
Alexandra	nil	nil	nil	nil	1	nil	nil	nil	,,	,,	106	111
Alfred	3	2	3	1	5	2	1	,,	,,	,,	81	82
Port Shepstone ..	nil	nil	nil	nil	4	nil	nil	,,	,,	,,	100	106
Camperdown	10	5	1	2	3	7	,,	,,	4	,,	90	94
New Hanover	6	2	1	1	4	5	,,	1	nil	,,	178	180
Umvoti	3	6	2	5	1	2	,,	nil	,,	1	188	204
Krantzkop	3	3	2	2	nil	nil	,,	,,	,,	nil	46	58
Richmond	13	17	6	7	nil	4	,,	,,	,,	,,	125	130
Pietermaritzburg ..	15	13	5	5	9	6	,,	,,	,,	,,	142	145
Impendhle	nil	5	nil	5	1	nil	,,	,,	,,	1	104	107
Durban	,,	2	nil	2	nil	,,	,,	,,	,,	nil	70	75
Lower Tugela	8	12	8	nil	nil	,,	,,	,,	,,	,,	74	78
Mapumulo	nil	1	nil	1	nil	,,	,,	,,	,,	,,	—	—
Inanda	6	3	6	nil	nil	2	,,	,,	,,	,,	37	37
Polela	4	4	1	2	6	2	,,	,,	,,	,,	157	161
Ixopo	21	15	3	7	16	13	,,	,,	,,	,,	257	261
Dundee	12	13	12	3	1	2	,,	,,	,,	2	202	212
Helpmakaar	2	1	nil	1	nil	2	,,	,,	,,	nil	29	54
Vryheid	27	16	13	7	nil	15	,,	,,	,,	,,	258	284
Babanango	4	nil	nil	nil	3	4	,,	,,	,,	,,	93	93
Ngotshe	22	9	2	nil	nil	32	,,	,,	,,	,,	93	102
Paulpietersburg ..	2	12	2	1	nil	nil	,,	,,	,,	,,	71	78
Nqutu	3	1	3	nil	nil	,,	,,	,,	,,	,,	39	13
Nkandhla	3	1	2	1	nil	,,	,,	,,	,,	,,	15	20
Newcastle	nil	2	nil	2	nil	,,	,,	,,	,,	,,	265	265
Utrecht	1	nil	,,	nil	4	1	,,	,,	,,	,,	145	145
Eshowe	3	4	,,	2	2	2	,,	,,	,,	,,	59	59
Mtunzini	7	2	1	nil	1	8	,,	,,	,,	,,	62	64
Emtonjaneni	3	2	1	nil	nil	nil	,,	,,	,,	,,	61	61
Lower Umfolosi ..	2	1	1	nil	2	1	,,	,,	,,	,,	71	71
Hlabisa	nil	1	nil	nil	nil	nil	,,	,,	,,	,,	15	15
Klip River	17	12	2	9	5	,,	,,	,,	,,	,,	294	295
Bergville	1	1	nil	nil	1	,,	,,	,,	,,	,,	132	132
Estcourt	20	8	3	2	2	14	,,	,,	1	1	337	353
Weenen	16	10	4	1	2	6	,,	,,	nil	nil	76	87
Lion's River	6	2	1	2	3	6	1	,,	1	,,	153	157
Ingwavuma ..												
Ubombo ..	nil	1	nil	1	nil	nil	nil	,,	nil	nil	—	—
Ndwandwe	,,	1	,,	1	nil	,,	,,	,,	,,	,,	—	—
TRANSVAAL :—												
Barberton	15	18	5	11	18	8	2	—	—	—	129	159
Carolina	10	2	3	—	1	12	—	1	—	—	23	27
Piet Retief	6	10	5	5	3	1	—	—	—	—	116	125
Pietersburg	21	15	5	6	2	8	—	—	—	—	396	441
Waterberg	1	—	—	—	—	1	—	—	—	—	65	74
Zoutpansberg	9	13	9	6	—	—	—	—	—	—	130	134
Ermelo	—	1	—	1	—	—	—	—	—	—	21	30
TRANSKEI :—												
Bizana	all susp.	all susp.	whole infected	whole infected	nil	nil	nil	nil	nil	nil	21	21
Butterworth	25 L 3 F	3 loc.	nil	3	9 L 1 F	,,	,,	,,	,,	,,	12	12
Elliotdale	all susp.	1	whole infected	1	nil	,,	,,	,,	,,	,,	10	10
Engcobo	,,	1	,,	1	,,	,,	,,	,,	,,	,,	23	25
Flagstaff	.,	all susp.	,,	whole infected	,,	,,	,,	,,	,,	,,	15	15
Idutywa	,,	2	,,	2	,,	,,	,,	,,	,,	,,	13	13
Kentani	,,	1	,,	1		,,	,,	,,	,,	,,	14	14
Libode	,,	nil	,,	nil	,,	,,	,,	,,	,,	,,	12	15
Lusikisiki	,,	all susp.	,,	whole infected	,, ,,	,,	,,	,,	,,	,,	22	22
Matatiele	1	1	1	nil	4	,,	,,	,,	,,	,,	96	98
Mount Ayliff	all susp.	all susp.	whole infected	whole infected		,,	,,	,,	,,	,,	16	17
Mount Currie	nil	nil	nil	nil	,,	,,	,,	,,	,	,,	136	139
Mount Fletcher ..	4 L	nil	nil	nil		,,	,,	,,	,,	,,	28	28
Mount Frere	all susp.	5	whole infected	3	nil	1	,,	,,	,,	,,	20	20
Mqanduli	,,	nil	,,	nil	nil	nil	,,	,,	,,	,,	13	14
Ngqeleni	,,	4	,,	1		,,	,,	,,	,,	,,	16	16
Port St. John's ..	,.	all susp.	,,	whole infected	,,	,,	,,	,,	,,	,,	9	10
Nqamakwe	1	nil	nil	nil	7	1	,,	,,	,,	,,	11	13
Qumbu	all susp.	5	whole infected	5	nil	nil	,,	,,	,,	,,	14	14
St. Mark's	nil	nil	nil	nil	2	,,	,,	,	,,	,,	14	14
Tabankulu	all susp.	all susp.	whole infected	whole infected	nil	,,	,,	,,	,,	,,	24	28
Tsolo	,,	4	,,	1	nil	,,	,,	,,	,,	,,	18	18
Tsomo	nil	nil	nil	nil		,,	,,	,,	,,	,,	12	12
Umtata	all susp.	4	whole infected	4	14 nil	,,	,,	,,	,,	,,	29	30
Umzimkulu	20	14	2	2	7	5	,,	,,	,,	,,	105	106
Willowvale	all susp.	1	whole infected	1	nil	nil	,,	,,	,,	,,	16	16
Xalanga	nil	nil	nil	nil	nil	,,	,,	,,	,,	,,	10	10

APPENDIX II.

SHEEP DIVISION.

The report on the work of the Sheep Division for the year 1918, will, as in previous years be dealt with in two sections; the one on the measures adopted for the eradication of scab, the other with the activities connected with the improvement of the Sheep and Wool Industry.

1. Eradication of Scab.

Administration.—The Chief of the Division, as Chairman of the Central Wool Committee, appointed in connection with the Imperial Wool Purchase Scheme, was absent from the Division since the beginning of the year, the Principal Sheep Inspector for the Union acting as Chief during that period. Other members of the staff are still retained by the Defence Department.

The field staff of the Division for the Union was as follows:—

Cape Province	16	Seniors	214	Inspectors.
O.F.S. Province	3	,,	57	,,
Transvaal Province	4	,,	87	,,
Natal and Zululand	2	,,	30	,,
Itinerants..	..	,,	20	,,
Total for the Union	25	,,	408	,,

The increase in the number of itinerants over the previous year was necessary owing to simultaneous dipping operations in the Transvaal, Cape and Orange Free State. During the year 37 inspectors were appointed, 7 inspectors resigned, 4 were dismissed and 1 suspended, whilst 16 inspectors died, 11 of them succumbing as the result of the Spanish influenza.

Appointments.—The increase in the number of itinerant inspectors was caused through (*a*) the extension of protected areas, (*b*) the necessity of cleaning up an area before protection can be granted, (*c*) the control of the annual removal of sheep from summer to winter grazing and *vice versa*, which all meant dipping under supervision on a large scale and the relieving of officers on extended sick leave.

Legislation.—No amendments or additions to the existing regulations were made. It is, however, the intention to subject to revision all the regulations framed under the Stock Diseases Act in connection with scab eradication. This work was commenced in 1918 and it is hoped to have a new issue of the Sheep Inspectors Manual containing these regulations completed during 1919.

Mention must be made that whilst the majority of stockowners realise the benefits to be derived from the strict enforcement of and compliance with the scab regulations, there are instances, in various parts of the Union where a great deal of apathy still exists.

Further, the Division cannot speak too highly of the splendid support its officers have had from many Magistrates in the Union with reference to scab cases tried and fines imposed under the Act and Regulations; but very keen disappointment is felt where in some instances the verdicts of Magistrates have left the impression on both the Inspector and the accused as being lenient out of all proportion to the seriousness of the charges brought forward.

The following return shows the number of cases tried, the number of convictions and the total amounts of fines:—

Prosecutions under the Scab Regulations for 1918.

Province.	Prosecutions.	Convictions.	Fines.		
			£	s.	d.
Cape and Bechuanaland	876	6,662	2,716	11	0
Transkei	454	394	825	18	0
Transvaal	103	89	305	10	0
Orange Free State	195	165	647	15	0
Natal	427	382	810	0	0
Total	2,055	1,692	£5,305	14	0

Compulsory Dipping and Dipping Operations Generally.—Compulsory dipping was applied to and completed in the districts of Barberton, Carolina, Lydenburg and a portion of Middelburg in the Transvaal, Cradock and Somerset East in the Cape. Dipping opera tions in the districts of Kingwilliamstown, Stockenstrom and Victoria East in the Cape had to be suspended on account of the Influenza epidemic. This compulsory dipping is a preparatory measure to bring these districts under protection. Although the application of this measure has had considerable success it does occur that cases of scab infection are subsequently reported. This can hardly be avoided when it is borne in mind that dipping takes place on a very large scale, and that wet weather or a drought during such operations, necessitating the temporary suspension of work, has in many instances proved a great obstacle.

Referring to dipping operations generally, apart from the foregoing, it may confidently be stated that these have been a success as a whole, owing in large measure to the fact that inspectors are instructed to personally deal with outbreaks of scab, by having infected flocks dipped under their supervision wherever possible. Then again farmers are taking a keener interest in having their sheep dipped. There are various instances on record where groups of sheep farmers have on their own account carried out combined dipping of their flocks.

On the other hand obstruction is still encountered in parts from owners who do not collect all their sheep for dipping purposes. Not only are natives in particular guilty of this offence, but even European owners will often endeavour to evade the dipping of their sheep particularly when the infection occurs during the trek season.

Approximately 7·70 per cent. or 6,686,000 sheep were dipped throughout the Union during the year in operations other than simultaneous dipping, representing a total of 14,738 infected flocks.

Protected Areas.—Protection has undoubtedly proved its value and success and has been the cause of a widespread demand from farmers in non-protected districts to be included in protection. This has been a source of great satisfaction. The Division has, therefore, with the approval of the Minister, extended compulsory dipping operations to the districts previously alluded to. Up to the end of the year, however, the following districts and areas had been proclaimed protected and semi-protected:—

Cape.—The districts of Steynsburg; portion of Molteno, ditto, Albert, Middelburg; portion of Cradock, Colesberg, De Aar, Philipstown; portion of Hopetown Britstown, Hanover, Richmond, Victoria West, Carnarvon, Murraysburg; portion of Graaff-Reinet, Mossel Bay, Molteno, Hopetown, Prieska, Riversdale, Ladismith; portion of Swellendam, Somerset East, Fort Beaufort, sub-district of Venterstad, George, Uniondale, Knysna, Humansdorp, Uitenhage, Port Elizabeth, Alexandria, Albany, Bedford, Bathurst, Peddie, East London; portion of Kingwilliamstown, Komgha, Stutterheim, Queenstown, Tarkastad, Hofmeyr.

Transvaal.—Wolmaransstad, Carolina; Western portion of Barberton; portion of Lydenburg; ditto, Middelburg.

Orange Free State.—Ladybrand, Senekal, Winburg, Thabanchu; Western portion of Ficksburg; South-eastern portion of Bloemfontein; Northern portion of Wepener.

Through various causes, however, such as very wet weather, the influenza epidemic, illegal introductions, dealt with elsewhere in this report, and in no small measure through lack of an adequate staff of field officers, the position threatened to become unmanageable. This will certainly influence the granting of further protection in the near future. If ever there was a time when the lack of a staff of competent itinerant sheep inspectors to assist area inspectors was keenly felt it was in connection with the operations connected with the establishment of protection.

Protection was in many instances extended solely to farms adjoining areas already protected for geographical and commercial reasons and as this has sometimes involved as much work as that connected with the inclusion of larger areas it is seriously contemplated, as far as possible and without entailing hardships on farmers, not to extend protection to individual farms but only to whole districts or entire areas of inspectors except in cases where an owner in a non-protected district possesses an adjoining farm in a protected area.

Movement of Stock—Annual Treks, etc.—The movements of small stock by reason of drought or for winter grazing (annual treks) as well as illegal movements and introductions, have always been a burning question of considerable magnitude. There cannot be the slightest doubt that if the regulations at present in force are to be effectively carried out the means placed at the disposal of this Division will have to be considerably increased. This has been felt and urged year after year.

It should be borne in mind that nearly all the Inspectors whose areas are in country suitable for winter grazing or where suitable grazing is to be had during drought, have to deal with immense numbers of small stock in a season in addition to the local flocks of such areas. Under these circumstances an inspector may be called upon to handle from 20,000 to 80,000 additional sheep in a season. Neither is it extraordinary for 500,000 sheep to be involved in a trek in a particular part of the Union—another factor of importance is that many inspectors have areas of such large extent that they are unmanageable and cannot be effectively controlled.

The necessity for means to adequately cope with these yearly recurring difficulties is patent. In the past and particularly during 1918 this Division was, therefore, compelled to steadily increase the staff of itinerant sheep inspectors. These officers are allocated for duty in parts requiring such extra help including simultaneous dipping operations. The probabilities are, therefore, that the establishment of a large staff of itinerant sheep inspectors will have to be considered very shortly.

Much of the infection in areas otherwise clean or practically free from scab is ascribable to illegal introductions of infected stock by speculators who indiscriminately move and forward stock for slaughter purposes. Unscrupulous stock owners also make themselves guilty in this respect. These movements are only too easily possible in view of the circumstances above outlined.

In addition to their ordinary duties inspectors have dealt with 1,446 travelling infected flocks in their areas, representing 470,336 sheep and goats. A further source of much trouble and annoyance is the introduction of stock from adjoining territories such as Basutoland, Bechuanaland and the South-West Protectorate. Although there are proclaimed ports of entry by which stock is to enter the Union a great deal of smuggling takes place and it is absolutely impossible for the inspectors whose areas adjoin those territories to have a knowledge thereof, although the police have rendered valuable assistance in this respect, particularly as far as the South-West Protectorate border is concerned. Swaziland, Bechuanaland, Rhodesia and especially Basutoland remain constant sources of infection.

The Native Territories, Native Reserves and Locations within the Union also give considerable trouble as the native cannot be relied upon to produce all his stock for inspection and treatment. The nature of the country coupled with the size of some of the locations makes the surreptitious movement of flocks an easy matter and at the same time difficult to control by the Inspector. It is, however, the intention to effect an amendment of the regulations whereby it is hoped to have a firmer control over the natives in such reserves and locations. As regards the Native areas outside of the Union the only remedy lies in the adoption and strict enforcement of scab legislation by them. In this respect Swaziland has already fallen into line.

Regarding the continued movements of infected stock by rail the practice has been adopted, as provided for in the regulations, of immediately reconsigning such stock back to the loading station if the point of interception is not too far removed to cause the animals to suffer unnecessarily by such return. The same practice as adopted in previous years in dealing with infected stock arriving at the various abattoirs is being continued. The extent to which movements of sheep (infected) have to be dealt with is further shown by the numbers of slaughter sheep sent to the Abattoirs at Maitland, Cape and Newtown, Johannesburg, shown by the following figures compared with previous years:—

Place.	Year.	No. of Sheep and Goats.	No. Infected.	Percentage.
Newtown, Johannesburg..	1913	791,962	57,469	7·25
	1914	774,794	25,427	4·57
	1915	738,058	49,335	6·68
	1916	673,558	28,594	4·24
	1917	660,306	50,963	7·71
	1918	635,223	39,402	6.20
Maitland, Cape	1914	256,068	24,426	9·50
	1915	293,258	29,448	10·04
	1916	302,601	41,562	13·73
	1917	289,675	66,402	22·90
	1918	277,180	65,670	23.69

The higher percentage of infection for the Cape is ascribable to the circumstances previously referred to, namely, the introduction from the North-Western Cape and particularly from the South-West Protectorate.

During the year 5,709 consignments of small stock were handled at Johannesburg.

The state of scab infection for the Union is exemplified by the following tables:—

SCAB INFECTION FOR ALL DISTRICTS IN THE UNION THROUGHOUT THE YEARS 1917 AND 1918.*

Province.		Free from Scab.	Under 3%.	Under 6%.	Under 10%	Under 15%.	Under 20%.	Over 20%.	Total Districts.
Cape ..	1917	0	25	25	28	13	9	14	—
,, ..	1918	3	34	37	15	9	10	6	114
Transvaal	1917	0	1	6	1	6	5	3	—
,, ..	1918	0	2	4	7	5	2	2	22
O.F.S. ..	1917	0	3	4	5	1	5	6	—
,, ..	1918	0	5	5	1	7	2	4	24
Natal ..	1917	0	7	1	5	4	2	0	—
,, ..	1918	3	14	4	4	4	4	0	33
Totals ..	1917	0	36	36	39	24	21	26	—
,, ..	1918	6	55	50	27	25	18	12	193

SCAB INFECTION FOR ALL DISTRICTS OF THE UNION AT 31ST DECEMBER, 1917 AND 1918.

Province.		Free from Scab.	Under 1%.	Under 2%.	Under 3%.	Under 4%.	Over 4%.	Total Districts.
Cape	1917	27	76	8	3	—	—	—
,, ...	1918	41	51	11	3	5	2	114
Transvaal ..	1917	6	12	4	—	—	—	—
,, ...	1918	3	9	6	1	1	2	22
Orange Free State	1917	3	13	6	2	—	—	—
,, ,,	1918	5	10	3	1	4	1	24
Natal	1917	6	13	1	2	—	—	—
,, ...	1918	11	12	7	3	—	3	36
Totals	1917	42	114	19	7	—	—	—
Union	1918	61	82	27	8	10	8	196

* Based on 1916 figures.

It must be pointed out here that the differences in the totals for the districts of Natal including Zululand for the years 1917-1918 are accounted for by the fact that the numbers of sheep and goats in many of them are very small, hence some districts have been grouped together. Besides this during the years 1917-1918 changes have also been made in these groupings.

The quarantines imposed during the year and reflected in the first table show that there was less infection during 1918 as 54 per cent. of the districts in the Union had 6 per cent. scab and less as compared with 39 per cent. for 1917. The same improvement is shown for the districts showing higher percentages of infection. The position at the close of both years reflected in the second table shows that about 87 per cent. of the districts of the Union showed 2 per cent. of scab and less for 1918 as compared with 96 per cent. for 1917. This increase of infection is due to the causes obtaining at the end of the year referred to elsewhere in this report.

The following statement gives a comparison of infection in relation to total stock as at 31st December, 1917 and 1918 as well as during these years:—

NUMBER AND PERCENTAGE OF INFECTED STOCK.

Province.		At 31st December, 1918-17.						Total Flocks quarantined during the year.	
		Total Flocks.	Total Stock.	Infected Flocks.	%	Infected Stock.	%	Number.	Percentage.
*Cape ..	1917	127,087	22,368,141	362	0·28	117,814	0·52	9,618	7·57
,, ..	1918	134,031	27,633,046	766	0·57	339,783	1·23	6,477	4·83
Transvaal ..	1917	49,905	6,066,378	230	0·38	62,884	1·03	6,536	13·09
,, ..	1918	46,622	5,710,014	711	1·52	129,763	2·27	4,234	9·08
O.F.S. ..	1917	30,198	8,962,764	177	0·58	92,664	1·03	3,256	10·78
,, ..	1918	25,740	11,113,605	306	1·19	166,415	1·49	2,215	8·60
*Natal ..	1917	42,572	3,545,118	122	0·28	43,841	1·23	2,596	6·09
,, ..	1918	38,505	3,148,663	346	0·90	78,895	2·50	1,812	4·71
*Union ..	1917	249,762	40,942,401	891	0·36	317,203	0·77	22,006	8·81
,, ..	1918	244,898	47,605,328	2,129	0·88	714,856	1·50	14,738	6·01

* Based on 1916 figuses as no return prepared for 1917.

From the above statement it will be seen that very satisfactory progress was made during the course of the year in the eradication of scab as substantial decrease in this respect is shown over the previous year. Had the epidemic not made itself so deeply felt towards the end of the year the decrease in the percentage of infection would have been very gratifying indeed. Owing to the above cause, however, the position as at 31/12/18 is not so favourable as that compared with 31/12/17. The position amounts to this that scab in the Union decreased during the year by 2·80 per cent. but that the number of infected stock at the end of the year shows an increase of 0·52 per cent. over that at the end of the previous year.

Dipping Tanks.—There can be little doubt that the futility of combating scab and ultimately eradicating it without dipping tanks has become patent to many sheep farmers. Hence too the progress that can be reported in the provision of dipping tanks. Nowadays a model sheep dipping tank is an object striven for by sheep farmers and those who have been backward and apathetic in this respect have more reasonable views now. Some stockowners who had cattle tanks only have decided to build sheep tanks as well as it has become clear to them that it costs no more to provide a sheep tank than it does to empty the cattle dip out of the cattle tank for sheep dipping purposes and again later to buy fresh cattle dipping fluid. The custom of using neighbours tanks is also fast disappearing and is discouraged as much as possible by sheep inspectors. It is, however, no easy task to get farmers to abandon prejudice and their tanks of obsolete type. One of the directions in which very satisfactory results have been achieved is the provision of tanks on farms used periodically for winter grazing. Whilst dealing with this subject mention must again be made of the co-operation during the year 1918 this Division has experienced from other Departments of State and large landowning companies as referred to in previous reports.

The position for the Union as regards dipping tanks is as follows:—

Province.	Number of Tanks at 31.12.18.	Number provided during 1918.	Number still required.
Cape	21,968	581	1,123
Transvaal	5,556	483	1,562
Orange Free State	10,003	253	671
Natal	3,216	210	542
Totals for Union ..	40,743	1,527	3,898

The average number of tanks constructed yearly in the various provinces since 1915 is as follows:—Cape, 528; Transvaal, 367; Orange Free State, 192; Natal, 298.

Dipping Materials and Dip Depôts.—Sheep dips and dipping ingredients continued to be scarce during the year and ultimately became almost unprocurable. As an instance sulphur may be mentioned. This article was charged for at the rate of 50s. per 100 lbs. in the beginning of 1918, but towards the close of the year the price was as much as 75s. per 100 lbs. Prepared sheep dips also sold at prohibitive prices, and farmers had to contend with considerable profiteering by storekeepers, and all Provinces of the Union were to some extent seriously affected.

It has occurred that farmers sometimes travelled for over 100 miles in order to procure a dip for their sheep only to find that this was not available at any of the stores.

The Division saw itself faced with the problem of finding means whereby some of the remoter districts of the Union (North-West Cape Province) could be supplied with reliable dip at fairly reasonable prices. In view therefore also of the petitions from sheep farmers in these districts the Minister of Agriculture approved of the establishment as a temporary measure of dip depôts in the parts seriously affected in order to afford relief until more normal times and prices are reached.

The sale of dip at these depôts is for the greater part under the supervision of the local sheep inspector or failing this of other persons willing to store and dispose of the materials free of charge or at a reasonable commission. In this manner the Department, making use of Government rates for transport by rail, is in a position to sell to farmers at cost price plus 1 per cent. for incidentals. The depôt keepers have to render quarterly returns to and deposit all monies received by them with the local Magistrates who again report to the Department of Agriculture. In many instances this has been no easy matter for Magistrates as the nature of the districts supplied with the dip involved considerable time in proper administration. This Division cannot therefore speak too highly of the valuable assistance rendered by Magistrates' offices in this respect.

The results have been generally satisfactory because the measure has not only succeeded in counteracting profiteering by the storekeepers who were obliged to considerably reduce prices but farmers have been placed in the position to procure a good dip at a reasonable price.

Approximately 5,000 gallons of dip were supplied to depôts during 1918.

Dip depôts have been established in the districts and at the places mentioned below:—

Namaqualand: Haramoep, Steinkopf, Port Nolloth, Brakputs, Garies, Bowersdorp, Waterkraal, Gamoep, Kraalfontein, O'okiep. *Van Rynsdorp*: Nieuwerust, Kliphoek, Nieuwefontein, Vleermuisklip. *Kenhardt*: Pofadder, Boom River. *Prieska*: Omdraaisvlei, Wildebeestpan, Draghoender, Nelspoortje. *Hay*: Griquatown. *Calvinia*: Brandvlei.

As times and conditions become normal these depôts will be gradually closed down.

Compensation Loss through Dipping.—During the year 1918 an amount of £1,015 19s. 3d. was paid out in settlement of 15 claims dealt with for sheep lost through dipping. In only one or two instances was the loss ascribable to negligence on the part of the Inspector.

Compensation for Loss of Animal Transport.—The problem of procuring salted animals for sheep inspectors located in horse sickness areas has always been a difficult one. It has become more aggravated on account of the war as the South-West and East African campaigns depleted the country of nearly all of its valuable salted or immunised horses and mules. A considerable sum is paid annually in compensation for losses of this nature and for some reason or other horses have succumbed to the diseases during the year 1918 in parts where previously horsesickness was unknown. This is probably due to the fact that the rainy season of 1918 was excessively wet. Altogether 102 claims for compensation were paid of which 61·76 per cent. was due to horsesickness and 38·23 per cent. to other causes. The total amount involved is £2,219 17s. 6d. for the financial year.

II. Sheep and Wool.

Staff.—The Sheep Division has suffered a very severe loss indeed in the death through the epidemic of two of its most capable experts, Mr. E. A. Goddefroy, Cape, and Mr. I. P. Wessels, Free State.

The present staff of experts is distributed as follows:—

Cape:—1 Senior Expert and 2 sheep and wool experts.
Orange Free State:—1 Senior Expert and 1 sheep and wool expert.
Transvaal and Natal:—1 Senior Expert and 2 sheep and wool experts.

The sheep and wool section is controlled by a Principal Sheep and Wool Expert with headquarters at Pretoria.

Judging by all the reports received from the various experts it remains an undeniable fact that the present staff however capable and willing cannot by any means cope with half of what is expected of it nor with what it is called upon to perform. The reports further are unanimous in stating that sheep farmers are becoming daily more keen to profit by the advice and services of the experts. This is clearly demonstrated by the fact that great strides have been made by these farmers and breeders in improving their stock by importation of pedigree animals and particularly by wise selection and breeding under the guidance and advice of the experts.

As an indication of the amount and variety of work performed by the members of the experts staff during the year the following resume is given:—

Expert.	No. of farmers visited.	No. of lectures.	No. of meetings attended.	No. of shows. attended.	No of demonstrations given.	No of sheep classed.	Mileages covered.
1	119	16	14	10	4	35,334	4,961
2	117	—	2	7	8	43,505	3,943
3	127	47	10	9	2	25,537	9,925
4	236	15	9	10	14	50,572	7,081
5 (died)	78	5	3	8	6	21,136	3,410
6	154	3	7	2	1	35,956	6,215
7	93	2	7	5	5	54,625	3,678
8 (died)	152	7	4	9	1	44,082	5,711
9	369	—	4	1	6	59,405	4,606
10	130	1	4	2	1	50,759	4,624
	1,575	96	64	63	48	420,931	55,154

The totals of the mileages travelled give an idea of the great distances that have to be covered by these officers in order to reach the farmer requiring their services. But when one recollects that over a thousand farmers have availed themselves of expert advice the outlook is decidedly promising, particularly in view of the policy of the Division to gradually pay more attention to those farmers who have not had the guidance of experts at all and to leave those for the time being who have been better served in this respect in past years.

The totals for lectures also include series of lectures the experts have been called upon to give on behalf of the various agricultural schools in the Union. The numbers of sheep classed by the experts represent only 1·1 per cent. of the total sheep in the Union. This is eloquent proof of the magnitude of the work still to be done. Mention must also be made of the fact that two sheep inspectors who are thoroughly qualified for the work of classing have been assisting the Senior Experts in the Cape and Free State respectively in classing sheep, and their performance is not recorded in the table above referred to.

Although great strides towards improvement have been made by wool growers in the manner in which their wools are classed and baled, apart from the good effect the Imperial Wool Purchase Scheme has had in this respect, the necessity of these good practices has not yet sufficiently penetrated to the minds of a good many others. Then the need of good wool presses in quantity is also keenly felt. Generally speaking the scarcity of wool packs and presses has been a great drawback in the profitable disposal of wool owing to the very strong measures adopted under the Imperial Wool Purchase Scheme, under which wools had to be well and compactly pressed with a view to meeting the exigencies of limited cargo space. However, with the improvement in shipping facilities as a r of the termination of the war this drawback is very probably going to be elimir a great extent in the near future. There is nothing that has stimulated the wool grower to greater effort for improvement than the high prices paid during 1917 and particularly during 1918 for well sorted and well packed wools.

The keen and progressive wool grower has fully demonstrated that by adopting up to date methods and availing himself of the guidance of the experts he has been the man to profit most in the end. A lot has still to be done to educate the less progressive farmers in this respect but this cannot be properly attempted unless the expert staff is considerably increased, and the post is moreover of such a nature as to induce only qualified bilingual men to offer themselves. There is however a pleasing feature to report and that is the short and vacation courses of instruction in sheep and wool at the various schools of agriculture are made use of with great enthusiasm by young farmers. The result is that these courses are popular and have mostly been booked up some time ahead.

On the other hand in addition to their many duties the experts have to give a considerable amount of time to these lectures which could otherwise more advantageously have been given to their field work. This has caused some dissatisfaction as the man who can afford to attend the courses has the advantage of expert instruction and the man in the country who cannot do so and who is in greater need of help and advice is at a considerable disadvantage. The experts moreover are placed in a very unfavourable position as they have to refuse hundreds of applications for their services on account of the largeness of their areas and because in addition they are called upon to do purely college work which should strictly speaking not be included in the range of their duties at all.

Prices of Wool, Mohair and Skins.—Prices for these articles remained very firm and even showed an advance over the previous year. In wools, "snow whites" ranged from 45d. to 50d., "grease" 12 months from 18d. to 32d., 6 to 9 months 9d. to 16d., lambs 10d. to 18d. Mohair fetched from 18d. to 32d., sheep skins from 8d. to 12d. and goat skins from 8d. to 15d.

The export figures for the year compared with 1917 are shown in the following totals for the Union:—

EXPORTS FOR 1917–1918.

	1917.		1918.	
	lbs.	£	lbs.	£
Wool:				
Washed	11,378	658	—	—
Scoured	11,935,868	1,804,647	15,242,881	2,792,124
Grease	105,709,896	6,977,065	100,391,617	6,897,506
Totals	117,657,142	8,781,280	115,634,498	9,689,630
Mohair	3,690,828	280,636	19,645,684	1,641,889
Sheepskins	24,951,345	1,432,788	25,284,318	1,329,236
Goatskins	4,504,586	367,992	5,888,351	405,369

The United States of America, Japan, and Canada, were the biggest buyers of our wools. America bought 82 per cent., Canada 8 per cent. and Japan 5 per cent. of our scoured wools, whilst for the grease wools America accounted for 35 per cent. of the purchases, the United Kingdom for 35 per cent. and Japan for 28 per cent.

For mohair the United States and the United Kingdom were the principal buyers to the extent of 75 per cent. and 24 per cent. each respectively. The United Kingdom and America were the principal buyers for sheep skins to the extent of 66 per cent. and 33 per cent. each in the order named. In goatskin purchases the United Kingdom took 65 per cent., America 31 per cent.

The Imperial Government's control of the wool trade practically closed the English market for South African wools except such supplies as were sold under the Government purchase scheme. Outside of this the Union had to rely on American and Japanese demands which is borne out by the foregoing figures.

From the reports of the Trades Commissioner of the Union in London it appears that our twelve months wools have made great strides in popular favour and are being largely used by the Bradford trade in blending with the best Australian wools. The United States have also come to realise the value of the South African product and this has also tended to keep prices firm.

Generally speaking, however, our wool is still lacking in clean yield and does not compare as well as it might with the yield of the bulk of Australian clips.

The loose packing or baling is another great defect and is a disadvantage of considerable magnitude that our wool export has to suffer from in competing with the exports from other dominions.

Diseases and Drought.—Of the various diseases from which sheep suffer, wire worm and blue tongue are still the most serious causes of loss to the sheep farmer. It has however been demonstrated that by the consistent application of the remedies against these diseases in districts where they are prevalent, it has been quite possible for sheep farming to be taken up with success, which has proved a great boon to farmers.

Blowfly and geilziekte also gave considerable trouble. Disease, favoured by abnormally wet weather coupled with ravages of drought in various parts of the Union accounted for great losses to the pastoral industry as is shown by the following figures:

Province.		Total sheep and goats.	Losses from Disease.		Losses from Drought.	
			Number.	%	Number.	%
Cape		27,633,046	1,099,453	3·99	148,326	0·50
Transvaal		5,710,014	514,457	9·13	11,496	0·20
Orange Free State		11,113,605	432,798	3·89	46,826	0·18
Natal		3,148,663	272,160	8·64	5,708	0·18
Total for Union ..	1918	47,605,328	2,318,868	4·87	212,356	0·44
,, ,, ..	1916	40,942,401	1,236,033	3·01	1,711,672	4·18

It will be seen that during the year the losses from disease have been very severe indeed, the Transvaal and Natal suffering most in this respect. However the losses through drought were by no means so heavy as in previous years. Furthermore it will be observed that small stock in the Union increased by 6,662,927 since 1916.

Up to the year 1913, the total small stock in the Union exceeded 47,000,000. Heavy losses through drought and disease in subsequent years accounted for the total being brought down to a little over 40,000,000 until better seasons in 1917 and 1918 made it possible for the old total to be reached again at the end of last year.

The Influenza Epidemic.—The epidemic has unfortunately most seriously hampered the operations of the Sheep Inspectors and the Sheep and Wool Experts. The year 1918 was looked forward to constitute a record on previous years which fell within a period of acute war conditions, during which time nearly all branches of activity were practically paralysed. The year 1918 gave better promise of success and all officers were putting forth a genuine effort to bring things into line again with every indication of success. The epidemic starting in the last quarter of the year which coincides with the height of the shearing season unavoidably put a check on the dipping of sheep which is undertaken at this time on a large scale. The simultaneous dipping operations which had already been delayed on account of the heavy rains had to be postponed till the ensuing year, and the extension of protection was considerably hampered.

The sheep inspectors throughout the Union were instructed to render whatever aid they could in the relief of suffering which was indeed terrible in outlying districts. In consequence there was not much opportunity for sheep inspector's work at a time it was most needed. Unfortunately too, unscrupulous farmers, speculators and stock buyers took advantage of these chaotic conditions and trekked indiscriminately with large numbers of stock which were sometimes badly infected.

These conditions applied equally to the sheep and wool experts who at this time of the year are called upon to class sheep and demonstrate the proper grading and packing of wool clips. Their programme, usually booked months ahead, had to be entirely abandoned much to the disappointment of many sheep owners.

As a matter of fact there were very few Inspectors or experts who escaped the epidemic, and 11 Inspectors and 2 experts succumbed to its effects. The Division feels that it cannot be chary in its praise of all the officers who willingly helped to bring relief during these trying times. Many an officer was incapacitated and could not resume his duties as he had to be allowed sufficient time to recuperate with consequent further delay in the work of the scab eradication.

General.—Notwithstanding the very serious adverse circumstances of shortness of staff, drought, disease and epidemic referred to in this report there has still been an allround satisfactory progress. Farmers are rapidly improving their stock, the number of stud breeders is increasing and the latter find good custom among the progressive breeders within the Union. The time is not far distant when South Africa will not need to import pedigree stock from oversea. The Merino sheep of the Wanganella and Tasmanian types is steadily replacing other types and there is a strong tendency discernible to have a good strong constitutioned sheep for both wool and mutton yield. As parts of the Union most suitable for sheep farming, but for the present still undeveloped are being opened up South Africa should hold its own in the wool and mutton markets of the world as it undoubtedly possesses all the possibilities. At the moment there are sheep in this country as fine in every respect as Australia could wish to produce.

During the latter part of November a conference of Senior Sheep Inspectors was held in Pretoria which lasted several days and which was also attended by Mr. Enslin, although he was at that time still Chairman of the Central Wool Committee.

Finally a word of praise is certainly also due to the members of the clerical staff of the Division at Head Office for the concientious manner in which they carried on the arduous administrative and clerical duties under the most strenuous circumstances with the additional disadvantage of being under-staffed.

It is however hoped that speedy reorganisation here will bring the much needed relief.

WILLIAM L. CURRIE,
Acting Chief, Division of Sheep.

ANNEXURE I.—STATEMENT SHOWING DISPOSAL OF THE SOUTH AFRICAN WOOL CLIP FOR THE SEASON 1917-1918.

I. (*a*) The season's clip for the period 1st August, 1917 to 31st July, 1918, has been estimated at		500,000 bales.
(This figure has been arrived at by taking the average number of bales of grease and scoured wool exported, etc., from South Africa during 1912 to 1916.)		
(*b*) In addition there were :		
(1) Awaiting shipments at ports on 31st July, 1918		107,731 ,,
(2) Up country not disposed of on 31st July, 1917, approximately ..		54,511 ,,
Total quantity which had to be dealt with during season under review		662,242 ,,
II. The above total quantity is accounted for as follows :		
(*a*) Number of bales left in the Government Scheme after withdrawals, etc...		119,383 ,,
(*b*) Sold and exported outside of Government Scheme from 1st August, 1917, to 31st July, 1918 :		
United Kingdom	2,468 bales.	
France	310 ,,	
Canada	4,503 ,,	
United States of America	284,445 ,,	
Japan	107,979 ,,	
		399,705 ,,
(*c*) Estimated quantity sold in open market and awaiting shipment on 31st July, 1918		72,135 ,,
(*d*) Estimated quantity unsold and lying at ports on 31st July, 1918		70,019 ,,
(*e*) Estimated quantity unsold and still up country on 31st July, 1918 ..		1,705 ,,
(This does not include 7,000 odd bales of wool still to be delivered under the Government Scheme.)		
Total		662,242 ,,
III. (*a*) From Statement II (paragraphs (*c*), (*d*) and (*e*)) it will be seen there are open market wools (sold and unsold) awaiting shipment in South Africa on 31st July, 1918		143,859 ,,
(*b*) To this is to be added Government wools unshipped on 31st July, 1918 ..		73,988 ,,
(*c*) Total of season's wool in Union on 31st July, 1918		217,847 ,,

APPENDIX III.

VETERINARY RESEARCH.

General.—This, my first Report, as Director of Veterinary Research is amplified somewhat more than has been customary. This is intentional, and, I would submit, desirable so that readers of Parliamentary papers may obtain not only an insight into what has been done, but also an impression of what remains to be done, and I would take this opportunity of emphasising attention to the remarks made by yourself in your Annual Report of last year. You state ("page 13") "It is evident that if the two branches of work (*i.e.*, routine and research) are to receive the attention they merit the staff of the Division must be materially increased, as it is a physical impossibility for the existing staff to cope with the work, no matter how willing it may be."

I accept the term "work" here to mean the demands put upon us by the public. For that alone we have neither the staff nor the facilities to perform it with any degree of satisfaction to the stockowning community or to ourselves. But in addition to the enquiries forced upon our notice it should be our duty to anticipate and foresee at least some of the problems of Veterinary Research (for to us they should be apparent), and carry out the duties of investigation as leaders rather than followers. That is the spirit of Research which should be fostered.

The great increase in the volume of routine work synchronizes with the period of the war, during which development, even to the extent of keeping pace with demands, was not possible. Now, however, the conditions are changing rapidly, and if the Union is to receive credit for its potential richness as a stock country, real and intensive expansion of Research must take place.

Staff.—Sir Arnold Theiler handed over the office of Director of Veterinary Research on 13th April, 1918, and I would take this opportunity of paying a passing tribute to his exertions as a pioneer of Veterinary Research in South Africa, where not alone, but throughout the world, the beneficial influence of his work is felt.

It is with very great regret that I have to record three deaths among the Staff during the year.

Mr. Wm. Robertson, who for many years prior to Union was the Director of the Veterinary Institute at Grahamstown, died in December, 1918. Mr. Robertson had been acting Director of Veterinary Research in 1912-1913, and was stationed at Grahamstown at the time of his death. He was the senior Officer of the Division, and his loss is severely felt. Mr. Robertson's character, personality and ability had endeared him to all sections of the community, and to the stockowners of the Eastern Province in particular I would express the sympathies of the Department.

Mr. J. A. Dickason, Yard Foreman at the Grahamstown Laboratory succumbed during the Influenza epidemic. Mr. Dickason had been in Government Service since 1904, and most of the time had been stationed at Grahamstown. He was a zealous and capable official, and in him the Department has lost a faithful servant.

Mr. M. J. Scrooby, temporary stockman at Onderstepoort, died in Nyasaland while on Active Service. During his short tenure of office Mr. Scrooby had proved himself a most capable officer, and is one very difficult to replace.

I have to record the loss by transfer and resignation of four professional officers.

Mr. J. Walker was transferred to British East Africa as Veterinary Pathologist. Mr. D. Kehoe was appointed Professor of Pathology at the Royal Veterinary College, Dublin. Mr. P. R. Viljoen was appointed Professor of Veterinary Science at the Transvaal University College, Pretoria. Mr. G. de W. de Kock left Onderstepoort in order to continue his studies towards a medical degree.

Dr. F. Veglia is still on Active Service in Italy.

Mr. W. H. Andrews returned from sick leave in June, 1918.

No new appointments among the professional staff were made during the year, but the Principal Veterinary Officer, Mr. C. E. Gray, has kindly offered to loan some officers from his already depleted staff in order that our routine work may be kept up.

The personnel of the Professional Officers of the Division at the 31st March, 1919, was:—

Director of Veterinary Research	Mr. R. Eustace Montgomery.
Senior Veterinary Research Officer (Onderstepoort)..	Mr. D. T. Mitchell.
Senior Veterinary Research Officer (Pietermaritzburg)	Mr. W. H. Andrews.
Veterinary Research Officer (Onderstepoort) ..	Mr. E. M. Robinson.
Bio-Chemist	Dr. H. H. Green.
Entomologist	Mr. G. A. H. Bedford.
Ecologist	Mr. A. O. D. Mogg.

There exist vacancies for an Assistant Director of Veterinary Research, and seven Veterinary Research Officers, which latter posts at the present time it seems impossible to fill.

Veterinarians are practically unobtainable just now; the demands for the limited number of graduates is constantly increasing, as not only are greater numbers required in countries already possessing a Veterinary Staff, but the Governments of smaller territories now appreciate the economic advantages of Veterinary Advice and supervision to stockowners. The number of graduates from the schools of Great Britain is not sufficient to comply with existing requirements.

It is to be added, also, that for Laboratory and investigation work, not all graduates possess those attributes essential to success.

I am firmly of opinion that the establishment of a Veterinary Faculty in South Africa will in the future considerably alleviate this shortage and the resulting stagnation. It is essential, however, that if constituted, such a Faculty be developed on the most liberal and modern educational lines.

Sir Arnold Theiler generously agreed to take charge of the Vryburg Station when Mr. Viljoen resigned. It would otherwise have been impossible to keep that Laboratory going, as no officer could be spared from the Staff. For this same reason it has been necessary temporarily to close down the Grahamstown Institute.

The year has been an exceptionally trying one for every member of the Staff. In addition to the extra work falling upon them owing to the depletion of the professional members, the demands made by the public have increased very materially. It is therefore with the greatest pleasure that I have to record the hard work performed by them, and the loyalty and support afforded to me during a time which in ordinary circumstances would have been trying, but which has been increasingly so owing to this being the first year under my control.

Travelling.—It was apparent that I could not be of full service to the Division or to the country until I had familiarised myself with some of the Districts more important to us from the standpoint of disease. In addition to the inspectional visits to the branch Laboratories at Grahamstown, Pietermaritzburg and Vryburg, I attended the Agricultural Union Congress in Johannesburg and in Cape Town. Together with Mr. Viljoen a tour of the Gal-lamziekte area in Bechuanaland was undertaken in September, and much valuable information was obtained from interested farmers.

Two journeys to Grahamstown were necessitated by the unfortunate death of Mr. Wm. Robertson, and the consequent closure of that Laboratory. I also attended meetings of the Advisory Board for Industry and Science in Durban and in Cape Town. Association with members of the Veterinary profession, with stockowners and with others interested has made more clear to me the requirements of this Division, if it is to perform adequately the duties imposed upon it.

Owing to the shortage of Staff it has not been possible for officers to visit farms or investigate outbreaks of reported disease to the extent desirable.

Publications. All officers of this Division have been engaged in bringing up their work into form for publication in the Fifth and subsequent reports of the Director of Veterinary Research. Sir Arnold Theiler was also engaged in this task, and much of the manuscript is now in the hands of the printer.

A pamphlet on "Slapziekte," which would appear to be identical with Dourine, was issued during the year.

Officers of the Division contributed several valuable papers to the South African Association for the Advancement of Science at their session in Johannesburg last June. These will be published in *extenso* in the Research Report of the Division.

Buildings.—Through an unfortunate oversight some most necessary buildings for the Laboratory and office extension at Onderstepoort were omitted from the schedule of works during the year. The facilities at Onderstepoort, Grahamstown and Maritzburg are no longer such as to enable the Staff to deal efficiently with the work demanded. The amount of Routine Vaccine preparation has assumed so great a total that further accommodation is essential.

The new Power House is now nearing completion, and the water tower which will provide reasonable storage in case of breakdown, and also a supply in the event of fire, has been arranged for. The erection of a Fly-proof stable intended for experimental work into Horse-sickness has been commenced.

Three new dwelling houses for the Staff were completed. These form a much necessitated addition to the housing accommodation, for situated as we are at Onderstepoort it is not possible for houses to be rented in the neighbourhood, and as will be apparent it is most desirable for technical officers to be resident at Onderstepoort, and so be able to continue their observations at all hours.

The Laboratory at Vryburg was completed during the year, and is gradually being got into working order.

Correspondence.—A heavy increase is again shown in the amount of correspondence dealt with by the Division, the details being as follows:—

Letters and Telegrams—Received: Onderstepoort, 39,170; Grahamstown, 2,202; Pietermaritzburg, 12,397. Despatched: Onderstepoort, 48,093; Grahamstown, 1,010; Pietermaritzburg, 11,685.

This represents a grand total of 114,557 received and despatched, as compared with the corresponding figures of 83,049 for last year.

Microscopical and Pathological Anatomical Examinations.—During the year under review a grand total of 24,139 smears and specimens were examined at the three Laboratories, of which "Onderstepoort" accounted for 13,384, Maritzburg for 10,138, and Grahamstown for 617.

The corresponding figures for the previous twelve months were:—"Onderstepoort," 13,751; "Maritzburg," 9,051; "Grahamstown," 1,107; total, 23,909.

The decrease in the number examined in Grahamstown is accounted for by the ill-health and death of Mr. Wm. Robertson.

As referred to in the past two Annual Reports only one officer is stationed at Pietermaritzburg, and with the constant drain upon his time for the examination of these specimens it is not possible for the officer to engage in any serious research or to visit outbreaks of disease, requests for which are being constantly received. Relief at this station is urgently needed.

I would express the hope that at no distant time it may be possible to have such a number of Officers attached to the Veterinary Division that smear examinations can be carried out by them. Reference to the nearest Laboratory can always be made when necessary, but if the microscopical diagnosis of such diseases as East Coast Fever and Anthrax could be prepared more expeditiously greater efficiency and economy would result.

Specimens for Serological and histological examinations could continue to be despatched to the Laboratories, as in these cases there is commonly less urgency for immediate diagnosis.

The number of serological specimens for the diagnosis of Contagious Abortion is steadily increasing, and with a more full understanding of this disease by stockowners there is no doubt that still greater demands will be made upon us.

During the year the test was undertaken on 1,243 samples received at Onderstepoort, and on 1,850 samples received at Maritzburg.

VACCINES.

Blue Tongue.—The issues of this Vaccine during the year amounted to 1,273,820, showing a falling off when compared with the figure of 1,876,740 for the previous twelve months.

The decrease in the demand for this Vaccine is accounted for by the favourable season just experienced.

An increase in the personnel dealing with Vaccine issues has enabled orders to be more promptly despatched than was formerly possible. Certain improvements can, however, still be effected.

Red-water and Anaplasmosis.—The total issues for this year amounted to 27,405 doses, of which 21,134 doses were issued from Onderstepoort, 2,901 from Maritzburg, and 3,370 from Grahamstown. It will be noted that a heavy increase is shown over the corresponding figure for the previous twelve months, when only 16,913 doses were issued.

Anthrax.—The output during the year exceeded all previous records, a total of 732,000 doses being issued, compared with 509,125 for the previous year, and 696,850 for 1916-1917, which latter was hitherto a record output.

This total does not, however, truly reflect the amount of work involved, since 481,775 doses were of the Double Vaccine, and therefore represents twice the quantity of material and labour.

I am not satisfied that the present system of Vaccine production is as perfect as it could be made. The results are certainly enthusiastically encouraging in the great majority of outbreaks, and compare most favourably with those obtained from the use of any other variety of Vaccine; but until we possess a knowledge of the reasons for the very occasional failure we are working in ignorance. The large collective losses from Anthrax in the Union justify an extensive enquiry into this disease and its prevention, and this will only be possible when our staff approaches its normal strength.

Black-quarter.—The demands for this Vaccine again show an appreciable increase, 431,090 doses being supplied during the current year, as compared with 354,750 for the preceding twelve months.

My remarks under the above heading of Anthrax are equally applicable to this disease. Experience of other countries teaches us that there may be varieties of this infection, and our Vaccines should incorporate all local strains. To a great extent this is effected, but a further enquiry is necessary in order to obtain infection from sources not yet incorporated. Stockowners would greatly assist by forwarding very thin strips of muscle from cases of Sponziekte which have been dried rapidly in the sun.

Wire-worm Remedy.—The demands for the Wire-worm Remedy resulted in a total number of 7,628,600 doses being issued, as compared with 7,203,700 for the previous twelve months. In addition to the sale of powder 8,863 dosing spoons, 1,593 dosing bowls were supplied. The powder is also now utilised for Worms and Opthalmia in Cattle, and 433 phials of Hydrochloric Acid and 123 Litre Measures were issued for these purposes.

The continued demand for this Remedy testifies to its efficiency in field practice. Extremely few complaints concerning it are received, and it may be admitted as filling a long felt want among sheep owners. These complaints refer chiefly to the trouble and danger of starving sheep, especially ewes and lambs for the "double" dosing, but as is now emphasised in the instructions, double dosing is only necessary when animals are grossly infected with Wire-worm, and continued regular single dosing will gradually obviate any necessity for the more drastic double method.

A few complaints indicate that the dose is not sufficiently large or powerful. It will be recognised that a standard dose cannot be expected to produce identical effects in every animal, even though they may be identical in age and weight. When the same treatment is applied to animals so different in weight and constitution as Persian, Merino and Wooled Persian, identical results ought not to be anticipated. It is for this reason that stockowners are requested to make for themselves experiments designed (1) to ensure that the standard dose (*i.e.*, the particular notched spoon issued from here) is non-toxic, and (2) that this dose is efficacious. For cases which the five-notch spoon does not appear sufficiently strong, spoons containing slightly larger doses have been made. It is anticipated that these will rarely be in demand, and they must of necessity, only be employed when past experience already demonstrates that particular sheep require a dose larger than that commonly found safe and efficacious.

Tuberculin.—The importation of this material from the Royal Veterinary College, London, was continued and 10,247 doses were reissued to the Veterinary Authorities in the Union.

Mallein.—The issue of Mallein only amounted to 7,900 doses, as compared with 12,955 during the preceding year, the decrease being due to the fact that supplies were not required by the Military authorities.

Inoculation of Mules against Horse-sickness.—1,030 Mules were inoculated in the Union with material prepared at Onderstepoort; only 6 died whilst under treatment, a mortality of under one per cent.

RESEARCH.

General.—The heavy depletion of the staff has precluded Research work being undertaken in such a systematic manner as it should. The work of this class was largely "Observatory," by which term is meant that the experimental animals themselves answer the various questions put and these latter are so set that answers are to be anticipated. While much good is derived from the observatory method, and for some disease it is the only means as yet known whereby progress can be affected, it is nevertheless expensive and demands a large number of animals and consequent extensive facilities for realisation. The development of Laboratory work, as such, will no doubt materially assist in obtaining results, but for this, constant application by skilled workers is essential, and that at the moment is not possible.

Horse-sickness (Horses.)—Arrangements were made to inoculate a batch of horses monthly at the Laboratory under the compensation scheme, a total of 421 being treated, of which 37 died, a mortality of 8.8 per cent.

While this mortality is higher than was hoped for and anticipated, it is still within a figure that is "practicable." Subsequent figures from "aanmaning" or relapse have but rarely been reported—the season has, however, been a mild one for Horse-sickness, and no judgment as to the final results is therefore possible.

It would appear that by the storage of Horse-sickness serum the virus of *Pernicious Anaemia* as a complicating factor may be excluded. While the evidence in this direction is strong, enquiry may demonstrate that a more feasable and a more sure way of elimination is possible. Improved technique by the utilisation of separate instruments for each animal was introduced last year, and had without question contributed to the freedom from this complication in the horses passing through our hands.

I am glad to report that *Staggers*, which so severely interfered with Horse-sickness inoculations two years ago, has not worried us during this year. We are still ignorant of its cause, and must therefore be prepared to encounter it again at any time without warning.

Numerous experiments with regard to various strains of Horse-sickness were carried out, with a view to standardising what is now a variable quality, and consequently liable to unforseen change.

It was hoped that by a process of elimination certain species of mosquitos had been arrived at, which according to the laws of probability would prove to be the vectors of Horse-sickness. Unfortunately the results of experiments were vitiated at the last moment by a refusal of these insects to breed under the conditions they were submitted to, and at least one other season must elapse before definite data on this point can now be obtained.

Further experimental enquiry into *Pernicious Anaemia* and *Staggers* was conducted, and attempts at prevention and treatment by means of drugs were attempted. This enquiry revealed the interesting point that under certain conditions the injection of a solution of Methylene Blue induced a type of anaemia quite comparable to the pernicious form, but differing through being non-inoculable to new animals. The importance of this matter at the moment lies in the very common use of Trypanblau in the treatment of Red-water, and the fact that owing to war conditions substitutes for this substance—also aniline dyes—are appearing on the market.

Lamziekte.—Negative or indecisive results from experiments at Armoedsvlakte continued, and the decision was made to recommence the enquiry from the beginning. In the course of these and largely as a result of enquiry and observation in the endemic area, a series of experiments was repeated with the result that a disease indistinguishable from Lamziekte was produced. More extensive tests carried out under increasingly rigorous conditions indicated that the disease produced was Gal-lamziekte, and it then became established that animals eating flesh, bones and other animal tissue in certain stages of decomposition acquired the disease. It would appear that certain special—if not specific—microbes must be present to cause infection, for decomposing material from centres where Gal-lamziekte is not existant have so far failed to produce symptoms. It is established also that the eating of blow fly (*Pycnosoma*) larvae and pupae, obtained in the Lamziekte area may also reproduce the disease. So far similar larvae and pupae from clean area have failed to affect cattle.

The problem of isolating the particular factor in decomposition is before us now. Another feature of Gal-lamziekte requiring much concentrated work for elucidation is the relation in which certain classes of veld stand towards the disease. It is known that in certain areas and in certain seasons cattle acquire a perfect "Craving" for bones and rubbish.

Enquiry into the cause of this may disclose the reason and a method of economically controlling that craving and thereof nullifying or reducing the animals desire to eat the decomposing bone and animal tissue which cause the disease.

It has not been possible yet to reopen any investigations into Imapunga, a disease of the Eastern Province of the Cape which presents certain similarities with Gal-lamziekte.

Contagious Abortion.—Observations in Europe and America have demonstrated that the use of a living Vaccine upon non-pregnant cattle had induced a degree of immunity enabling a considerable percentage of those animals, when subsequently pregnant, to carry their calves to full term, in spite of living in heavily infected stables.

Experiments to control these observations in South Africa were commenced during the year, and a limited number of field tests on infected farms were also undertaken. At the moment there are technical difficulties in the way of making large quantities of this Vaccine, the keeping qualities of which are limited, and the bulk at present considerable. Should it, however, prove efficacious these difficulties can no doubt be overcome in course of time.

Red-water and Anaplasmosis.—Opportunity was afforded during the year of enquiring into the duration of virulence of the respective parasites of Red-water and Anaplasmosis after removal from an animal. The point at issue being to ascertain for how long the Vaccine supplied by this Division remained effective after despatch. The number of animals available for the experiment was not sufficient to cause any final decision to be reached, but the indications are forcibly to the effect that while the Anaplasmosis remains virulent for over one week, the parasite of Red-water dies within two or three days of withdrawal.

Should this view be substantiated it would appear that Red-water Vaccine could, only be employed with confidence up to about 48 hours of collection.

Enquiry in different parts of the Union indicate clearly that there is much need for investigation into the different types of Red-water occurring. The question is difficult of solution only owing to the necessity for conducting the experiments on imported cattle, which have with certainty never suffered or been in contact with a Red-water infection. Owing to this limitation our energies are restricted.

Anthrax.—Prior to the excessive diminuation in the Staff, experiments were in progress to ascertain the degree of immunity conferred by a natural attack of the disease, the degree induced by inoculation with Vaccine carried out on different systems, and also to obtain definite information regarding possible methods of infection. In connection with the last named it is by no means clear whether infection is always, or commonly, through the mouth; and much evidence is required as to whether animals may act as harbourers or reservoirs of the causal organism without themselves becoming affected.

These, and many other problems in connection with the disease await solution.

An anti-anthrax serum has been prepared, which may be of value as a curative agent, and also to control immediately outbreaks of the disease which appear to be spreading rapidly. The immunity produced is of very short duration and requires support from the use of Vaccine; serum therapy has therefore but limited application at present and is costly, but may be of great value in certain outbreaks.

Slapziekte.—A few cases of the disease have been brought to our notice during the year, but despite numerous attempts failure has attended all efforts to obtain a strain of trypanosome therefrom. Additional serological tests carried out by the Canadian Authorities again indicate that Slapziekte of South Africa is identical with Dourine of Canada.

A Bulletin on this disease was published during the year.

Trypanosomiasis.—Increasing agitation concerning the question of tsetse flies in Zululand, and their relation to game and the disease Nagana, has taken place recently. There is no doubt that recent researches in other parts of Africa demonstrate that widely accepted views on this question are erroneous, and that further enquiry is essential, if the problem is to be tackled in an efficient manner. This I hope can be undertaken as soon as additional officers are available.

Calf Pneumonia.—Several reports as to the occurrance of this disease have been received from Natal. Such enquiry as was possible was conducted, but without definite results being obtained. It was ascertained that at one time a form of preventative vaccine was issued from the Maritzburg Laboratory, but unfortunately no records of the investigations leading to its preparation can be found, and the enquiry must be conducted *de novo.* The mortality from this disease on some farms is high.

Bloedpens.—Despite a strong desire to undertake investigations into this disease, a most serious enemy of sheep farmers in some districts, it has not been possible to approach the question seriously. A disease of similar symptoms and pathology occurred in British East Africa, from which a particular bacterium was isolated. Should the conditions be identical, the preparation of a preventative serum might be realised.

Gouwziekte.—Through the kindness of Mr. D. J. Strydom, of Olifantsfontein, we were again able to continue the experiments into this disease on his farm at Kaalfontein. Unfortunately from an experimental point of view, the season was not favourable, and there is therefore no progress worthy of record.

Stiff-Sickness.—Observatory experiments continued at Lidgetton in Natal, but as yet without any conclusive deductions being possible.

Worm Disease in Sheep.—An outbreak or disease simulating "Wire-worm" disease in sheep, was brought to notice near Cradock. On examination a minute hair-like worm was found embedded in the lining of the small intestine. This worm, called *Trichostrongylus* is so situated that it is doubtful whether ordinary medicinal agents will be capable of attacking it without seriously injuring the bowel wall. Enquiries were commenced to attempt the elucidation of its life history outside the sheep's body, in the hope that a weakened stage might be detected which would lend itself to attack and destruction. This work is still in progress.

Lung worm in sheep also attracted very considerable notice early in the year. The amount of damage actually due to this parasite is doubtful, but it affords much room for investigation as its life history is unknown, and medicinal treatment on a large flock is a matter of difficulty and uncertainty.

EUSTACE MONTGOMERY,

Director of Veterinary Research.

APPENDIX IV.

DIVISION OF DAIRYING.

I have the honour to submit my Annual Report in connection with the work of this Division, and other matters, for the period ending the 31st March, 1919.

Staff and Office matters.—During the period under review no changes in regard to the staff have taken place, except for the fact that both Messrs. Gow and Dewey were still away on Active Service.

The passing of the Dairy Industry Act through both Houses of Parliament has been responsible for a tremendous increase of both technical and clerical work, involving as it does, the opening and keeping of numerous registers, the issue of certificates, allotting registration numbers and registered marks to the various cheese factories, creameries, etc., all of which places had to be inspected and re-inspected before such certificates could be issued, and it will in consequence become necessary to increase both the technical and clerical staffs of this Division very shortly.

Butter and Cheese produced in the Union.

Total output of	1917. lbs.	1918. lbs
Butter by Creameries	13,698,081	13,939,558
Butter sold on Markets	3,213,490	2,781.490
Butter sold to Merchants	2,500,000	2,500,000
Totals	19,411,571	19,221,048
Cheese: Factories and Cheeseries	4,266,048	6,816,314

Although the total quantity of butter produced in 1918 shows a decrease of 190,523 lbs., this is easily accounted for by the Influenza Epidemic which prevented a large number of cows being milked owing to so many farms being deprived of native labour, and in numerous cases the farmers themselves being laid up. A plague of caterpillars also devastated large quantities of foodstuffs which otherwise would have been available for the production of cream. The position, however, in regard to the cheese industry is very satisfactory, showing as it does an increase of 2,550,266 lbs. over that produced in 1917. This result naturally led to an over-production for the local markets, but fortunately for the cheese manufacturers, a satisfactory contract was entered into with the Imperial Government, resulting in the surplus cheese being disposed of.

Imports for 1917 and 1918.

	lbs.	lbs.
Butter	26,891	67,275
Cheese	513,306	197,621
Margarine and Butter Substitutes	186,666	19,702
Ghee	895,575	540,858

In addition to the above, the following were imported but *re-exported* during 1918:—

	lbs.
Butter	2,358,094
Cheese	36.287
Margarine and Butter Substitutes	2,646
Ghee	9,380

With regard to the importation of both butter and cheese in 1918, the majority of this was utilised for military and naval purposes, as the following export figures clearly indicate that same was not required for local consumption:—

Export of Dairy Products from the Union: 1918.

	lbs.
Butter	1,316,834
Cheese	424,993

Official Milk Records.—The Official Milk Records Scheme is still making satisfactory progress and there is no doubt but that breeders are generally realising the value of this scheme, especially when pedigree stock are put up for sale and can authentically demonstrate the fact that the milk records of any particular animal are available, thus enhancing the value of the progeny of such cows when their milk records are known. There is every indication that other Pure Breed Societies are likely to join issue with the Friesland Breeders Association in regard to the taking of milk records: this will result in reducing the expenditure of this latter Association as many of the herds so affiliated are, in many instances, in close proximity to the herds already being tested, consequently the same recorder can undertake this work with very little additional expense.

Administration of the Dairy Industry Act, 1918.—The inauguration of this Act has, no doubt, already been productive of very good work and has had a steadying effect on the dairy industry as a whole. The right to systematically inspect all Creameries, Cheese Factories, etc., revealed the fact that drastic alterations to existing premises, from a hygienic point of view, were absolutely essential and in some instances new premises had to be erected before they could possibly comply with the requirements of the Act. Naturally when this Act was before Parliament it came in for considerable criticism, especially in regard to the conditions laid down for controlling the manufacture and sale of margarine and the moisture content in farmers' butter. From an administrative point of view, had the Act been passed as originally drafted, with perhaps a few exceptions, many anomalies which at present exist would have been avoided as the numerous amendments made by Parliament had a tendency to weaken the Act rather than strengthen same. The administration of this Act will naturally create a large amount of additional work in this Division as every Creamery, Cream Depôt and Cheese Factory in the Union will have to be inspected for registration purposes, and re-inspected before any permanent registration certificates can be issued; in addition to this, all men engaged in testing and grading at Creameries will have to be examined in order to ascertain whether they are competent to carry out such work. The issuing of certificates to men who are found competent is a very important matter, as under the Act no grading or testing work can be performed unless such certificates are held, and even when in possession of same, if it is proved that the holders are not carrying out their work correctly, their certificates can be cancelled; which action would preclude them from carrying on any such work in any Creamery in the Union. Regulations are being framed specifying the methods of testing and standardisation of all glassware used in connection with the purchase of milk and cream on a butter-fat basis. Owing to the fact that large stocks of glassware are held by the various Creameries, it has been decided to allow same to be used provided, on examination, they are found to be correct, although they may not comply with the standards laid down.

Cheese-making Industry.—As already stated, the position of the cheese industry is in a flourishing condition, but a tremendous amount of spade work has yet to be done in order to maintain the present satisfactory progress. Far too many small and badly equipped factories have sprung up everywhere, and in many instances, are under the control of persons who know very little, if anything, of the science and practice of cheese-making. This has had the natural result of far too large quantities of inferior cheese being placed on the market, which fact was fully borne out when cheese intended for export had to be strictly graded as nothing but first grade cheese was allowed to be exported and the percentage of 2nd and 3rd grade cheese as compared with that passed as first, was far too high. With a full staff working again, more attention will be paid to those factories which are turning out cheese of an inferior quality, as it is only by education in this direction that the quality of our cheese can be materially improved. Now that the Dairy Act is in force, many of our cheese factories which are badly constructed, especially in regard to the curing rooms will be obliged to put such matters right before they can be registered, and this in itself will greatly assist this promising industry. Another point where improvement is badly needed before a permanent export trade can be established is in regard to the packing of cheese and the making of a uniform sized cheese of not less than 60 or 70 lbs. in weight. Severe criticism was passed on the manner in which a large percentage of the cheese already exported had been packed, and the non-uniform size of same. The Home trade requires all cheese to be packed in standard crates and to be uniform in size, and these conditions will be insisted upon before any more consignments are allowed to be exported.

The Butter-making Industry.—The position of this industry, on the whole, can be considered satisfactory, but when viewed from an export standpoint, there is still a good deal of investigation work to be carried out before the majority of our butter can safely be regarded as being up to an export standard. Criticisms on consignments of butter already shipped complain of the want of uniformity in the flavour of our butters and lack of briskness in same. In my opinion the only remedy is the adoption of uniform pasteurising of all cream intended to be utilised in the manufacture of butter for the export trade. Further, a large percentage of our cream at present travels hundreds of miles unnecessarily, passing in many instances, several creameries en route; the solving of this problem, no doubt, is difficult as the practice in vogue of paying carriage on all cream supplies by the creameries encourages suppliers to send their cream to any creamery, irrespective of the distance the cream has to travel. There is no doubt but that the Dairy Industry Act will assist a great deal in solving this problem by insisting upon strict grading of all cream purchased, so that the supplier who insists on sending his cream such absurd distances will find when he has same either second or third graded, that it will pay him better to send it to a creamery nearer home.

General.—There are at the present time 64 Creameries, 38 Cream Depôts and 138 Cheese Factories in the Union; these figures, however, do not include private cheeseries which run into several hundreds. To keep in touch with all these establishments has been extremely difficult owing to the limited staff at my disposal and certain members of same being away on active service, and my thanks are due to the loyal and able manner in which my staff have supported me through these strenuous times. It has been suggested to me on many occasions that at some future period it would be a good idea, in order to get into touch with the back-veld farmer, to run what is known as a demonstration train. During the four years I was in Canada I had an opportunity of attending a good many of these demonstrations, and at all centres where they were advertised such demonstrations were largely attended by the farmers of the district, and in some instances the demonstration train was accompanied by several truck loads of stock of various breeds, and it was fully explained to the farmers, assisted by ocular demonstration, which breeds of animals were most suited to their particular districts. The time may not be quite ripe for inaugurating a similar system here, but I have no doubt whatever that such a scheme would bring the Department into closer touch with the farmers and prove of immense benefit to them.

E. O. CHALLIS,
Superintendent of Dairying.

APPENDIX V.

ANNUAL REPORT, 1918—1919.

DIVISION OF BOTANY.

Introduction.—The demands made upon the Division during the past twelve months have again been exceptionally heavy, both as regards requests for informaiton and advice, special investigations of botanical and pathological problems, and attendance of officers at farmers' and fruitgrowers' meetings.

Appeals have also been made for the permanent services of Mycologists in the Western and Eastern Provinces of the Cape of Good Hope. Fruit farming has reached such dimensions in both these areas and diseases are so rife there, that I am of opinion that the establishment of mycological laboratories would be fully justified and of immense benefit to the farming community. As the agricultural industry is expanding so rapidly, it is very probable that many of the problems confronting us will necessitate the establishment of temporary field laboratories for special investigations. In particular it is felt that the Division is urgently in need of a thoroughly competent organic chemist and plant physiologist to work on problems of plant nutrition and plant poisons. Experts with the necessary qualifications for work of this nature can, however, not be obtained for the meagre salaries which the Government has been in the habit of paying to Assistants in this Division, for hitherto we have been fortunate in securing the services of highly competent officials, who have accepted the posts offered, not for the sake of the wage, but rather for their love of the work and for opportunity for research. The result of the payment of such low salaries to botanical assistants in the Government Departments is becoming more patent every year, in that students will not specialise in botany in the Universities because they say—and rightly so—it does not pay. Botany therefore will not attract the best students so long as this state of affairs is allowed to continue, and it will become impossible to obtain the necessary material to assist in the development of the country, for after all it must be remembered that comparatively few persons are gifted by nature with the capacity for original research. Such gifted people are essential for opening up the natural resources of a young country and combating the troubles that will be encountered.

Progress has been made during the year with the investigations of fibre plants, plants useful for paper making, dye plants, food plants, oil plants, medicinal plants and noxious weeds. Generous gifts have been made to the National Herbarium, while rare and valuable works have been acquired for the library.

A Botanical Survey of the Union has been organised and launched, and a botanical museum has been established.

Definite progress has been made in the eradication of Citrus Canker, and considerable research work carried out in mycology and phyto-pathology. In particular Dr. Doidge prepared and published a most useful chart dealing with the control of fungous and bacterial diseases of plants.

The necessary greenhouse for infection work has not yet been built although the foundations are laid, and the material for the structure has arrived from oversea. A small greenhouse, however, was taken down at the Natal Herbarium, Durban, and erected at Pretoria to enable us to carry out a few of the citrus canker soil tests.

The work of the Division is still very seriously hampered through lack of more necessary clerical assistance. Representations have been made on this score year after year when my estimates are framed, but such details appear to be left to the discretion of the Treasury, who have deleted these items without looking into the merits of the case. I wish to point out that under such circumstances the country is not getting full value for its money when technical officers are compelled to do unnecessary administrative and clerical work.

The work of the Division is also greatly hampered for lack of room space, storage room, and laboratory accommodation. In particular there is a grave risk of fire destroying the valuable collections of plants, apparatus, books and records through such congestion. The seriousness of the situation has been represented repeatedly, but it would appear that nothing short of a calamity will move those responsible to action.

In this connection, I need hardly remind you, that funds for the erection of a greenhouse—one of the first essentials for our work—were not forthcoming until the Government had been mulcted in a large sum of money for compensation purposes.

If a similar state of affairs is allowed to continue with regard to the unsatisfactory housing of our collections and laboratory accommodation, and disaster overtakes us, it will not be possible to repair the damage done or replace the valuable and historic collections which are at present the property of the nation.

Correspondence.—The correspondence during the period under review was as follows: Letters and telegrams received, 4,275; despatched, 4,136.

Staff.—The Staff of the Division for the period under review consisted of:—

I. B. Pole Evans, M.A., D.Sc.	Chief.
E. M. Doidge, M.A., D.Sc.	Mycologist.
E. P. Phillips, M.A., D.Sc.	Botanist.
P.A. van der Bijl, M.A., D.Sc.	Mycologist in Charge, Natal Herbarium.
A. M. Bottomley, B.A.	Mycologist.
S. M. Stent	Herbarium Assistant.
Z. Findlay, B.A.	Herbarium Assistant
V. A. Putteril. M.A.	Mycologist.
A. M. King, B.A.	Mycologist.
K. L. Lansdell	Herbarium Assistant.
L. G. Bottomley	Herbarium Assistant.
I. Verdoorn	Herbarium Assistant.
L. Kresfelder	Lay Assistant.
H. V. King	Lay Assistant.
W. Schilz	Lay Assistant.
G. Hobbs	Lay Assistant (Natal Herb.)
C. L. Howlett	Lay Assistant.
E. M. G. Tennant	Clerical Assistant.
M. Stocks	Clerical Assistant.
K. E. Vos	Clerical Assistant.
M. D. Gunn	Clerical Assistant.
E. Linder	Clerical Assistant.

The following changes, etc., took place in the staff: Mr. L. Kresfelder—It was found necessary to transfer this officer from the Citrus Canker Staff to the General Office on the 8th May, 1918, to assist with fibres and other economic plants, etc. Dr. E. Percy Phillips was appointed on the 15th May, 1918, on a year's probation as Botanist in this Division. Miss A. M. King, B.A., resigned on the 22nd December, 1918, to get married.

I. BOTANICAL.

(*a*) *Stock Diseases.*

The Division has continued to co-operate with the Division of Veterinary Research in elucidating the unsolved stock diseases known as Gouwziekte in sheep, Styf-ziekte in cattle, and Dun-ziekte in horses. Arrangements have also been made in conjunction with the latter Division to undertake systematic feeding tests of the more commonly reputed poisonous plants of the country. The discovery of the cause of Lamziekte by Sir Arnold Theiler will necessitate a careful inquiry into the condition known as "pica." Plots of the more important and more common indigenous grasses have been laid down on the Botanical Station at Groenkloof for this express purpose and are likely to prove of immense value for practical tests in determining the actual food value and palatability of our indigenous grasses.

(*b*) *Fibre Plants.*

Hypoxis rigidula: A sample of fibre which was extracted from leaves of the plant *Hypoxis rigidula* and which occurs abundantly on the high veld in the Transvaal was submitted to the Imperial Institute for report as to whether a market could be obtained for the same and as to its probable commercial value.

The fibre was extracted from the leaves by the method of retting.

The Imperial Institute reported as follows:

"The sample weighed 7 lbs. and consisted of coarse, harsh, woody fibre, possessing little lustre. The material was fairly well cleaned on the whole, though in some places it showed groups of fibres held together by pithy matter.

"The fibre measured from 1 foot to 3½ feet in length, and was weak and very brittle. The colour was uneven but was mostly greyish-buff.

Results of Examination: The fibre was submitted to chemical examination at the Imperial Institute with the following results:

	Per cent.	
Moisture	9·6	Expressed on the dry material.
Ash	0·5	
A.—Hydrolysis loss	11·0	
B.—Hydrolysis loss	15·5	
Acid Purification, loss	0·3	
Loss on washing in water	0·5	
Cellulose	68·5	

"The losses on hydrolysis are small and this result usually indicates that the fibre would be fairly resistant towards the action of water. In this case, however, the small losses are probably due to the coarseness of the fibre and the consequent small surface exposed to the action of the chemical reagents. The somewhat low percentage of cellulose in the fibre shows that apart from its harsh and brittle nature it is not of such good quality as the fibres generally used for rope-making.

Commercial Valuation: The fibre was submitted for commercial valuation to brokers, who stated that owing to its extreme brittleness it would not be suitable for commercial use. If, however, this defect could be remedied it might be possible to use the fibre for spinning or brush manufacture.

"Remarks: Fibre represented by this sample could not be utilised for any technical purpose on account of its brittleness. No previous samples of *Hypoxis rigidula* leaf fibre have been examined at the Imperial Institute, and it is therefore not possible to state whether the brittleness is a constant feature of the fibre or whether it could be remedied by improved methods of preparation. Experiments to determine the latter point might be made in South Africa."

In view of the above remarks it is proposed to carry out further experiments regarding the preparation of the fibre.

Asclepias fruticosa: Samples of floss from the pods of *Asclepias fruticosa*, locally known as the "Kapok bos," are continually being sent to the Division for information as to its commercial value. The floss is frequently used in South Africa for stuffing pillows and mattresses. Material of this had been sent some years previously to the Imperial Institute for examination, and as a result it had been suggested that the floss might be used for life-saving apparatus, but a further sample had been asked for by the Institute. Arrangements were made for the collection of the seed of this plant and an acre of the same was planted on the Botanical Station at Groenkloof. When the pods ripened they were collected and the floss secured. The acre only yielded 19 lbs. of floss and 121 lbs. of seed. The floss was sent to the Imperial Institute and was reported upon as follows:

"Description of Sample: The sample weighed 15 lbs., and consisted of a soft, fairly lustrous, very pale brown floss of somewhat uneven character. Some of the floss was clean, but other portions contained a quantity of plant debris. The floss was inferior in colour, lustre and freedom from impurity to the previous sample from South Africa examined at the Imperial Institute.

"This Asclepias floss is similar in general appearance to Akund floss (*Calotropis sp.*) from India, but is more brittle and less resilient than the latter material.

"Results of Examination: The results of the chemical examination of the clean flowers are given in the following table, which includes for comparison the corresponding figures for commercial flosses, *viz.*, Java kapok (*Eriodendron anfractuosum*), Indian kapok (*Bombax malabaricum*) and Akund floss (*Calotropis sp.*):

	Present Sample of Asclepias Floss.	Java Kapok.	Indian Kapok.	Akund Floss (India)..
	Per cent.	Per cent.	Per cent.	Per cent.
Moisture	9·6	9·0	8·1	7·9
*Ash	3·6	1·3	4·4	4·9
*Cellulose	60·5	63·6	61·2	59·2
Length of staple	0·6 to 1·4 in. mostly 0·8 to 1·1 in.	0·6 to 1·0 in. mostly 0·75 in.	0·4 to 0·6 in. mostly 0·5 in.	0·8 to 1·2 in. mostly 1·0 in.

* Calculated on the dry floss.

"These figures show that this Asclepias floss is similar in composition to kapok and Akund floss.

"Commercial flosses are used chiefly in upholstery, and their value for this purpose depends upon their resilliency, Java kapok being the best in this respect. The present sample of Asclepias floss was much inferior in resilliency to Java kapok and also to Akund floss.

"Java kapok is also employed as a buoyant material for use in life-saving appliances, and is at present the only floss recognised by the Board of Trade for this purpose. In order to determine the buoyancy of the Asclepias floss in comparison with other flosses, tests were carried out at the Imperial Institute by placing 4 ozs. of the flosses in calico bags free from dressing, floating these in fresh water for 24 hours with 2½ lbs. of iron attached, and then noting the weight required to sink the bag. The results are given in the following table:

	Present Sample of Asclepias	Java Kapok.	Indian Kapok.	Akund Floss.
(1) Weight required to sink freshly-filled bags	82 oz.	82·5 oz.	103 oz.	77 oz.
(2) Weight required to sink bags after 24 hours in fresh water with 2½ lb. of iron attached.	73·5 oz.	89 oz.	102 oz.	45 to 69 oz.*
(3) Weight required to sink bags after rough treatment in water following (2).	7 oz.	52 to 77 oz.†	52 to 77 oz.†	8 to 12 oz.†
(4) Weight required to sink 24 ozs. of floss after 24 hours' immersion with 15 lb. of iron attached (calculated from (2)).	27·5 lb.	33·3 lb.	38·2 lb.	16·9 to 25·9 lb.

*Results varied in different experiments owing to absorption of water.
†Variable results due to difficulty of regulating severity of treatment.

"According to the most recent Board of Trade regulations a life-jacket for one person should contain at least 24 ozs. of kapok and be capable of supporting at least 20 lbs. of iron after having floated in water for 24 hours with 15 lbs. of iron attached. As the above trials were carried out with 4 ozs. of floss, 24 ozs. of the present sample of Asclepias floss would be capable of supporting 30¾ lbs. of iron when freely packed and 27½ lbs. of iron after floating for 24 hours with 15 lbs. of iron attached, thus satisfying the official requirements in this respect. The Asclepias floss is, however, considerably inferior to Java and Indian kapoks both in resistance to the action of water and in the ease with which it becomes water-logged when subjected to rough treatment. It resembles Akund floss in this respect and would consequently not be suitable as a buoyant material for life-jackets and other life-saving apparatus.

"Commercial Value: (1) The floss was submitted to a firm of brokers in London, who stated that it was of inferior quality and could only be used for stuffing, for which purpose it might be worth 3d. per lb. in London (February, 1919), with Java kapok at 1s. 6d. to 1s. 9d. per lb. Before the war the normal price of Java kapok in London was about 7d. to 9d. per lb.

"(2) A second firm considered that this floss was inferior to Akund as a stuffing material or for other purposes, but stated that it might be possible for them to find a market for the material if half a ton could be obtained for trial. They desired to know the price at which this quantity could be supplied.

"Remarks: The present sample of Asclepias floss is inferior in quality to that submitted in 1916, but the results of the investigation confirm those recorded in Imperial Institute Report dated 25th July, 1916.

"This Asclepias floss is inferior in buoyancy to Java and Indian kapok and could only be employed as a stuffing material in upholstery, for which purpose its low resiliency and brittleness render it inferior to Java or Indian kapok, or to Akund floss."

Sida rhombifolia is a common weed on waste ground around Pretoria, especially on poor soils. The plants as a rule do not obtain a height of more than 2½ feet under these conditions. As the plant was particularly plentiful in some areas, material was collected and the fibre extracted from the same by retting. Some 4½ lbs of fibre were submitted to the Imperial Institute, and this was reported on as follows:

"Commercial Valuation: This fibre would no doubt find a market in the United Kingdom but would realise much better prices if it were of greater length. Well prepared *Sida rhombifolia* fibre from India, which is usually from 5 feet to 6 feet long, has been sold in London at prices equal to that of 'first marks' jute, the present value of which is £36 per ton f.o.b. Calcutta (March, 1919).

"Remarks: The present sample of fibre behaved normally towards chemical reagents, and was soft and silky, but much shorter than is usual for well-grown *S. rhombifolia* fibre.

"It seems possible that the wild plants do not grow to any great size in the locality from which this sample was derived, and in this case the length of staple could perhaps be improved if the plants were cultivated."

(c) *Plants for Paper-making.*

Helichrysum argyrophyllum: Complaints having been made with regard to the spread of the plant *Helichrysum argyrophyllum* in the Eastern districts of the Cape Province, and in the view of the large quantities of material which are available in these parts, material of the same was secured and forwarded to the Imperial Institute in order that its value for paper-making might be determined. It was reported upon as follows:

"Description of Sample: The sample weighed 16 lbs. and consisted of the complete shrubby plants, composed of brittle woody stems bearing small greyish-white leaves and dry yellow unwithered flowers. The plants had an aromatic odour.

"Results of Examination: The entire material was submitted to chemical examination with the following results:

Moisture	10.6 per cent.
Ash, expressed on the dry material	9.6 per cent.
Cellulose, expressed on the dry material	36.4 per cent.

"The ultimate fibres of the plant measured up to 0·6 m.m. in length.

"The material, and also the cellulose prepared from it, appeared to be very unpromising for paper-making. An attempt was, however, made to prepare paper pulp from the material by cutting it into small pieces and then heating at 150° C. with 16 per cent. of its weight of caustic soda, a solution of 4 per cent. concentration being employed.

"After 9½ hours of this treatment the pulp was insufficiently boiled. An additional 4 per cent. of caustic soda was then added, and the boiling continued for a further 2 hours. Even after this drastic treatment the material was hard to beat and only furnished about 30 per cent. of a very dark brown pulp, yielding a rough paper which showed many dark 'specks' and shrank considerably on drying (see specimem enclosed with this report).

"Remarks: The results of the present investigation show that *Helichrysum argyrophyllum* would be of no commercial value as a source of paper pulp."

Panicum obscurans: Towards the close of summer many parts of the high veld in the Transvaal become densely covered with detached inflorescences of a grass commonly referred to as "Tumbling grass." The material drifts along in front of the wind and often lodges in such a quantity in sheltered spots that it frequently causes the stoppage of trains on the South African Railways, especially on the following sections, *viz.*: Breyton line, Mafeking line, South Eastern line (Volksrust), Witbank, Klipspruit-Nancefield.

A sample of this material was submitted to the Imperial Institute for ascertaining its suitability for paper-making. It was reported upon as follows:

"Description of Sample: The sample weighed 42 lbs. and consisted of fine, dried, straw-coloured grass, bearing a very large number of small chaffy bracts, the remains of the inflorescence.

"Results of Examination: The grass was submitted to chemical examination at the Imperial Institute with the following results:

	per cent.
Moisture	9.2
Ash, expressed on the dry grass	5.0
Cellulose, expressed on the dry grass	47.2
Length of ultimate fibres	0.3 to 2.3 mm. mostly 0.9 to 1.6 mm.

"In order to determine the suitability of the grass for paper-making it was treated with varying amounts of caustic soda under conditions similar to those used for the production of paper pulp on a commercial scale, and the results are shown in the following table:

Experiment.	Caustic Soda used.		Conditions of Boiling.		Parts of Caustic Soda consumed by 100 parts of grass	Yield of dry pulp expressed on the grass as received Per cent.
	Parts per 100 parts of grass.	Parts per 100 parts of Solution.	Time. Hours.	Temperature.		
A.	10	2	5	140° C.	8·2	46
B.	16	3	5	140° C.	11·6	43
C.	20	4	5	140° C.	12·6	39

"The results of these experiments showed that the grass gives a good yield of pulp, which is, however, not of very good quality, as although the paper produced does not shrink on drying it is marred by the presence of the numerous chaffy bracts, which are resistant to the action of the caustic soda and give the paper a rough, irregular surface (see enclosed specimens A. and B.). The bracts are also apparent as bright yellow specks in the bleached paper (see specimens A1. and B1.) A better pulp can be produced by the more drastic treatment of Experiment C., *i.e.*, by using 20 per cent. of caustic soda, but the bracts are still evident both in the bleached and unbleached papers, though to a smaller extent than before (see specimens C. and C1.)

"Remarks: On account of the presence of the small bracts referred to above and their effect on the paper produced, this *Panicum obscurans* grass is decidedly inferior as a paper-making material to the Tambookie, Dek, and other grasses from South Africa previously examined at the Imperial Institute, and would probably only be suitable for the manufacture of cardboard or brown paper."

Themeda Forskalii: In addition to the above, a sample of the grass *Themeda Forskalii*, commonly known as "Rooi gras," was also forwarded to the Imperial Institute for examination as to its suitability for paper-making. This is one of the most widely distributed grasses in South Africa, and often dominates the vegetation.

The material was reported upon as follows:

" Description of Sample: The sample, which weighed 16 lbs., had been cut into lengths of about 3 feet. It consisted of tapering stems about one-eighth of an inch in diameter at the base, with hard woody nodes at intervals of 12 to 18 inches. A sheathing leaf or the remains of a leaf occurred at each node, and the inter-nodes were filled with soft pith.

" Results of Examination: The grass was chemically examined with the following results:

Moisture	10·6	Calculated on the dry grass.
Ash	5·0	
Cellulose	55·1	

Length of ultimate fibres:—0·8 to 3·8 inches, mostly 1·5 to 2·0 inches.

" The grass was treated with a solution of caustic soda under conditions similar to those used for the production of paper pulp on a commercial scale, with the results shown in the following table:—

Experiment.	Caustic Soda used.		Conditions of Boiling.		Caustic Soda consumed per 100 parts of grass.	Yield of dry pulp expressed on grass as received. Per cent.
	Parts per 100 parts of Grass.	Parts per 100 parts of Solution.	Time. Hours.	Temperature.		
A.	8	2	5	140° C.	7·5	52
B.	12	3	5	140° C.	9·0	48
C.	16	4	5	140° C.	10·0	44
D.	20	4	5	140° C.	12·4	42

" The pulp contained in these experiments yielded a strong, opaque paper which did not shrink appreciably on drying. The pulps obtained in experiments A. and B. did not bleach well, but those obtained under the more drastic conditions of experiments C. and D. bleached easily to a pale cream colour.

" The results show that *Themeda Forskalii* grass yields about the same quantity and quality of pulp as other South African grasses, such as " Tambookie " and " Dek " grass, already examined at the Imperial Institute. The nodes of the grass are however harder than those of " Tambookie " and " Dek " grass and would necessitate thorough boiling and beating in order to break them up completely and obviate the presence of yellowish specks in the paper.

" Remarks: This *Themeda Forskalii* grass could not be remuneratively exported to Europe as a paper-making material, but it could probably be employed in South Africa as a source of paper pulp for local use or for export. As indicated above, however, the hard nodes of the grass are a disadvantage, and although they could probably be completely broken up when treating the grass on a commercial scale their presence would be likely to detract from the market value of the grass as a paper-making material."

(*d*) *Dye Plants.*

A number of preliminary trials have been carried out in the Laboratory during the year with the object of ascertaining what vegetable dyes can be procured in the country.

The following plants have yielded results of considerable interest:—

Aloe arborescens Mill; *Aloe speciosa* Bak; *Aloe Wickensii* Pole Evans; *Argemone mexicana* Linn; *Bulbine latifolia* R. & S.; *Cyperus esculentus* Linn; *Elephantorrhiza Burchellii* Bth.; *Euclea natalensis* A.D.C.; *Excoecaria africana* Müll; *Galium capensii* Thunb.; *Nidorella* sp.; *Parinarium Mobola* Olivier; *Pterocarpus angolensis* DC.; *Rhamnus prinoides* L'Herit; *Schotia* sp.; *Tagetes minuta* Lam.; *Uapaca Kirkiana* Muell.

(*e*) *Food Plants.*

Sesbania punctata, DC.: A form of this plant is extremely plentiful on the black turf ground on the Springbok Flats, Transvaal, and on the low-lying ground north of the Magaliesberg, where the seed is regarded by the local farmers as an excellent poultry food. A sample of the seed was collected and forwarded to the Imperial Institute so that its nutritive value and possible uses might be determined. It was reported upon as follows:

" Description of Sample: The sample consisted of small hard seeds having a shiny, dark greenish-brown coat. The seeds measured about one-tenth of an inch in length and possessed a fairly strong pea-like flavour and a slight aromatic odour.

"Results of Examination: The sample was submitted to chemical examination with the results shown in the following table, which includes for comparison the figures recorded for field beans, peas and soy beans:

	Sesbania Seed.	Field Beans.	Peas.	Soy. Beans.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Moisture	9·6	14·3	14·0	10·0
Crude proteins	32·9	25·4	22·5	33·2
Consisting of:				
True proteins	24·2	—	—	—
Other nitrogenous substances	8·7	—	—	—
Fat	6·2	1·5	1·6	17·5
Carbohydrates, etc. (by difference)	39·0	48·5	53·7	30·2
Fibre	10·9	7·1	5·4	4·4
Ash	1·4	3·2	2·8	4·7
Nutrient ratio	1 : 1·6	1 : 2·0	1 : 2·6	1 : 2·1
Food units	137	116	114	157

"The seeds yield no prussic acid but they contain a substance which responds to the usual tests for alkaloids. In view, however, of the fact that the seeds are used as poultry food in South Africa it seems unlikely that they contain injurious substances.

"The results of the analysis show that these Sesbania seeds contain a high percentage of protein and about 6 per cent. of oil. They compare favourably in composition with other leguminous seeds such as field beans, peas and lentils, but contain less oil than soy beans.

"Commercial Value: Samples of the seeds were submitted to grain and seed merchants and to manufacturers of feeding stuffs for opinions as to their probable uses and value. The merchants reported that there has been no actual experience of Sesbania seeds in this country and that it is difficult to supply any definite information regarding them without having trials made. Judging from the character of the seeds and the results of the analysis they considered that the Sesbania seeds might be utilised in place of peas, lentils and millet and that, if so, their value might approximate to that of the latter products, the spot price of which in London is abnormally high at present, *viz.*, £40 per ton. Experiments would, however, be necessary to determine their value, and the merchants suggested that a trial consignment of 5 tons of the seed should be sent to London in order to test the market.

"The manufacturers reported that in their opinion the Sesbania seeds could be utilised in the manufacture of feeding stuffs and they estimated their present value for this purpose at £17 per ton ex quay, Liverpool.

"Remarks: There do not appear to be any published records of the use of Sesbania seed as a feeding stuff. It is stated, however, that Sesbania Pea is grown in South California and Mexico for its stalk fibre, which is used for rope-making, and that the seed is obtained as a by-product and converted into meal. A sample of the seed is said to have been valued in England, in 1910, at £5 per ton, c.i.f., London, with soy beans at £8 per ton at Hull.

"The small size and hard coat of the seed are to some extent disadvantages, but apart from this the seeds have a high food value, and would, no doubt, find a market in the United Kingdom if trials should prove them to be quite harmless to animals. Information should be furnished as to whether a trial consignment of at least 5 tons can be forwarded to the Imperial Institute."

(*f*) *Oil Plants.*

A sample of oil said to have been obtained from the berries of *Heeria paniculosa*, and commonly known by the natives in Zululand as "Isifici," was submitted to the Department with the object of obtaining preferential rights for exploiting the plants on Crown lands in Zululand. Material of the berries were subsequently transmitted to the Imperial Institute for the purpose of ascertaining whether the fruits were likely to be of commercial value as a source of oil.

The sample was reported upon as follows:

"Description of Sample: The sample weighed 10 lbs., and consisted of flat berries about three-eights of an inch in length and irregularly ovoid in shape. The berries were covered with a closely adhering black skin, which was wrinkled and shiny.

"The pericarp, which was rather hard and sticky, enclosed a single seed, the kernel of which was soft and oleaginous. Many of the berries were shrivelled and immature, and some had been attacked by the larvæ of a small fly.

"Results of Examination.—Volatile oil from the pericarp: The pericarp of the fruits contained a volatile oil, the yield amounting to 5.5 per cent. of the weight of the entire fruits.

"The oil was mobile and colourless, and had no pronounced or characteristic odour. It was found on examination to have the following constants:

Specific gravity at 15/15°C, 0.832; optical rotation, D., 3.75°; acid value, 1.6; ester value before acetylation, 4.2; ester value after acetylation, 14.8.

"These results indicate that the oil consists principally of terpenes, and as it has no distinctive odour it would be of little commercial value.

"Fixed oil from the kernels: The crushed fruits, after the removal of the volatile oil by distillation, furnished a quantity of fixed oil from the kernels equivalent to a yield of about 30 per cent. from the entire fruits. The oil was viscous, clear and dark brown, and had an aromatic, not unpleasant odour.

"Remarks: The results of this investigation show that the fruits of *Heeria paniculosa* contain volatile oil in the pericarp and a fixed oil in the kernels, the amounts of these constituents being about 5.5 and 30 per cent. respectively on the weight of the entire fruits. The fruits are not readily separable into pericarps and seed or kernel, and if the fixed oil were extracted from the entire fruits it would be contaminated with the volatile oil and would consequently be of little or no technical value. In order to remove the volatile oil it would be necessary to submit the entire fruits to stem distillation, and the fixed oil could then be obtained from the residue by expression or by extraction with solvents. As already indicated, however, the volatile oil is not likely to be of much value and this treatment would probably not be remunerative.

"It does not appear likely that these fruits of *Heeria paniculosa* would find a ready market as a source of oil in view of the many other superior oil seeds which are available."

(*g*) *Medicinal Plants.*

With the object of gaining more definite information on the possibilities of the various indigenous plants which are reputed to be of medicinal value, the following were collected and forwarded to London for examination:

Mentha longifolia: This plant is abundant in the Somerset East district of the Cape Province, where it is used by natives chiefly for colds and headaches. The material was examined by the Imperial Institute and reported upon as follows:

"Description of Sample: The sample, which weighed 1¼ lbs. consisted of entire dried plants, excepting the roots, and had the characteristic odour of spearmint.

"The sample consisted of leaves (with small stems attached), 40 per cent., and loose stalks, 60 per cent.

"Results of Examination: The stalks were found on examination to contain practically no volatile oil. On distillation with steam the leaves with the small stems attached yielded 2.4 per cent. of volatile oil, equivalent to a yield of 0.98 per cent. from the entire original sample as received.

"The oil was mobile and colourless and had the strong characteristic odour and taste of spearmint oil. It was submitted to chemical examination with the results shown in the following table, which includes for comparison figures recorded for English and American spearmint oil:

	Present Sample.	English Spearmint Oil.	American Spearmint Oil.
Specific gravity at 15/15° C.	0·947	0·926 to 0·935	0·920 to 0·940
Optical rotation αD	−47·60°	−39° to −52°	−35° to −53°
Refractive index *nD*	1·4925	—	1·4800 to 1·4890
Ketones (estimated by sulphite method) as carvone, per cent.	70	30 to 48	35 to 66

The ketones present consisted largely or entirely of carvone.

"Commercial Value: The oil from this sample of *Mentha longifolia* is similar in character to English and American spearmint oil derived from *Mentha spicata* Huds., or *Mentha viridis* L., but it contains a higher percentage of ketones than these oils. In the latter respect it corresponds with Austrian spearmint oil, which is stated to contain up to 72 per cent. of carvone. German spearmint oil is sometimes distilled from *Mentha longifolia* Huds., var. *undulata* Briq.

"The quantity of oil obtained was too small for commercial valuation, but it may be stated that the market price of spearmint oil appears to be subject to considerable variation even under normal conditions. The price in the United Kingdom varied in 1911 from 8s. to 18s. per lb., and rose in 1913 to 24s. per lb.; in August, 1918, it was as much as 35s. per lb. The price appears never to drop below about 7s. per lb.

"Remarks: There is little doubt that the oil of *Mentha longifolia* from South Africa would be saleable as spearmint oil, but it would be desirable to have a larger sample for submission to essential oil merchants. In order to obtain sufficient oil for this purpose a consignment of about 1 cwt. of the leaves would be required, or a sample of 1 to 2 lbs. of the oil if this can be distilled in South Africa.

"In the fresh condition *Mentha spicata* and *Mentha viridis* are stated to yield 0.18 to 0.3 per cent. of volatile oil, but no information appears to be on record as to the yield from the dried plants.

"The bulk of the spearmint oil of commerce is consumed in the United States, where it is largely employed for confectionery purposes and in the manufacture of chewing gum."

Artemisia afra: This plant is widely distributed throughout South Africa and is particularly plentiful about Pretoria and the slopes of Magaliesberg. The plant is very aromatic and is much esteemed both by the Dutch and native people for its medicinal virtues. The Imperial Institute reported on it as follows:

"Description of Sample: The sample weighed 7 lbs., and consisted of greyish-buff unopened flower heads, spherical in shape and measuring about one-sixteenth of an inch in diameter. The freshly crushed material possessed a strong camphoraceous odour.

"Results of Examination. The flower heads were submitted to chemical examination at the Imperial Institute in order to determine whether santonin was present, and an investigation was also made of the volatile oil they contain.

"(1) The material was examined by three different methods for the presence of santonin, but with negative results in each case. A sample of the flower heads of *Artemisia maritima* readily yielded crystalline santonin when treated by the same methods. It may therefore be concluded that santonin was not present in this sample of *Artemisia afra* flower heads.

"(2) On steam distillation the material yielded 2.6 per cent. of a mobile oil, which was colourless when first distilled but rapidly assumed a pale green colour. A chemical examination of the oil gave the following results:

Specific Gravity at 15°/15°C	0·9273
Optical Rotation	16·4°
Acid Value	2·1
Ester value, before acetylation	+16·8
Ester value after acetylation	76·4
Ketones (expressed as thujone), per cent about	9·0
Solubility in 70 per cent alcohol soluble in	2·5 vols.

"The oil contained an appreciable quantity of cineole and, judging from the odour, thujone was also present, but the quantity of oil obtained was not sufficient for the isolation and identification of the latter constituent.

"Commercial Value: As the flower heads contain no santonin their only possible value would be for the essential oil present in them .

"Samples of the oil were submitted to two firms of essential oil distillers for an opinion as to whether it would be likely to be of commercial value, and enquiries were also made as to whether there is any present demand for 'wormseed oil' derived from *Artemisia maritima*.

"One of the firms stated that the market in the United Kingdom for an oil of this character is very limited, and that as a source of cineole it is unlikely that it could compete with eucalyptus oil. In their experience there is only a very small demand for the oil of *Artemisia maritima* in the United Kingdom.

"The second firm also considered it doubtful whether the oil would be of much commercial value, and stated that so far as they are aware there is very little demand for the oil of *Artemisia maritima*.

"Remarks: The results of this investigation indicate that the flower heads of *Artemisia afra* do not contain santonin and that the esential oil which is present is not likely to be of much commercial value. The oil of *Artemisia maritima* is obtained as a by-product in the product in the production of santonin, and was formerly utilised as a source of cineole, but this product is now obtained more cheaply from other sources."

Croton gubouga S. Moore: A small sample of bark was submitted to me for identification by Capt. Maberley, S.A.M.C., Roberts' Heights, Pretoria, who stated that he had in former years used the bark with considerable success in the treatment of Malaria. The medicinal properties of this drug were referred to in a paper delivered before the Cape Town Medical Society on August 25th, 1899, by Dr. Maberley, M.R.C.S. (Eng.), L.R.C.P. (Lond.), and published in the *Lancet* for September 30th, 1899.

The microscopic examination of the bark suggested that it might belong to the family *Euphorbiaceæ*, and after a considerable search the bark was found to agree in microscopic characters and physiological action with that obtained from *Croton gubouga*, S. Moore, which occurs on the Olifant's River in the Transvaal.

Material of this bark was collected and dried, and through the courtesy of Lt.-Col. Andrew Balfour, C.M.G., Director-in-Chief of the Wellcome Research Bureau, was examined and reported upon by Dr. Pyeman of the Wellcome Research Chemical Laboratories as follows:

"The ground bark had a very pleasant odour which, after a short time, produced a tingling sensation in the throat and nose.

"Test for alkaloid: A quantity (10 gm.) of the bark, when digested with Prollius' Fluid, yielded a test indicating the presence of a trace of alkaloid.

"The preliminary examination of a quantity (123 gm.) of the ground bark showed the presence of a crystalline substance of interest in the alcohol extract. It was therefore considered desirable to extract a larger quantity of the bark.

Accordingly a quantity (1450 gm.) of the ground bark was successively extracted with the following solvents:

Petroleum Ether (b.p. 35-60°) extracted	44 gms.=3·0%
Ether extracted	9·6 gms.=0·7%
Chloroform extracted	4·0 gms.=0·3%
Ethyl Acetate extracted	11·0 gms.=0·8%
Alcohol extracted	62·0 gms.=4·3%
Total extracted	130·6 gms.=9·0%

" Examination of the Petroleum Extract: This extract (44 gm.) was dissolved in ether, leaving only a trace of insoluble material which was removed. The solution was then extracted with the various alkalis, but only traces of material were extracted by ammonium and potassium carbonates. Potassium hydroxide, however, removed a quantity of dark brown potassium salt, which was acidified, extracted with ether, and gave 9.1 gm. of fatty acids. For the purpose of examination it was mixed with the similar non-volatile combined acids subsequently obtained after hydrolysis.

" The neutral material (31 gm.) was hydrolised by boiling for 1 hour with alcoholic potassium hydroxide, after which the solution was concentrated, mixed with water and extracted with ether to remove the unsaponifiable substances (8.7 gm.) These substances were found to contain only a trace of hydrocarbon or the usual aliphatic alcohols, but consisted mainly of oily matter, from which, however, a phytosterol (1.5 gm.) was isolated. This gave an acetyl derivative, which melted at 117 degrees after recrystallisation, but was obviously a mixture. It gave a strikingly affirmative Liebermann reaction.

" After the extraction of the alkaline liquid with ether, it was acidified with sulphuric acid, and the mixture distilled in a current of steam. This removed about 1.5 gm. of a mixture of volatile fatty acids. The acid distillate was dissolved in an excess of barium hydroxide solution, the excess of baryta removed by carbon dioxide, and the solution of barium salts concentrated. When an attempt was made to prepare silver salts of the fatty acids, metallic silver was immediately formed, and the solution instantly decolorised potassium permanganate solution, indicating the presence of *formic acid*. The solution of the barium salts was further concentrated, and a quantity of the more sparingly soluble barium salt separated. This was removed and converted into the acid (0.3 gm.), which was then dissolved in a slight excess of sodium hydroxide, and a silver salt prepared.

0·0413 gave 0·0178 Ag. Hence Ag.=43·1 per cent.
$C_8H_{15}O_2$ Ag. (Silver Caprylate) requires Ag.=43·0 per cent.

" The aqueous solution of the barium salts from which the above described acid was separated still contained formic acid, and, in order to remove it, the solution was acidified, shaken out with ether, and the ethereal solution well washed with water. In this way a further quantity (0.6 gm.) of acid was obtained, which was fractionally converted into silver salt. Five fractions were obtained and analysed:

1. 0·1315 gave 0·0665 Ag. Hence Ag.=50·6 per cent.
2. 0·1817 ,, 0·0934 Ag. ,, Ag.=51·4 ,,
3. 0·1448 ,, 0·0744 Ag. ,, Ag.=51·4 ,,
4. 0·0951 ,, 0·0490 Ag. ,, Ag.=51·5 ,,
5. 0·0273 ,, 0·0141 Ag. ,, Ag.=51·7 ,,

$C_5H_9O_2$ Ag. (Silver Valerate) requires Ag.=51·6 per cent.

" The above analyses indicate that the volatile acids (in an unusually large proportion of the total extract) consist mainly of formic, valeric, and caprylic acids. Acetic acid was not detected, but was probably present.

" The acid liquid which had been steam distilled was extracted with ether, and the dark coloured residue (14 gm.) digested twice with petroleum ether (b.p. 35-60°). This removed a dark coloured resinous substance (4 gm.) which was entirely amorphus. The petroleum solution when concentrated gave a quantity (10 gm.) of fatty acid which, for the purpose of examination, was mixed with the similar free acid (9.1 gm.) previously described. The mixture was resolved by means of the lead salts into the saturated (5.3 gm.) and unsaturated acids (13.0 gm.) which were not examined further.

" Examination of the Ether Extract: This consisted of a dark geen resin (9.6 gm.) which was digested with ether, when a quantity (1 gm.) of a light coloured substance remained undissolved. This substance was then almost insoluble in all the usual solvents except pyridine, from the diluted solution of which it separated in microscopic crystals. It was identified as a phytosterolin by means of the Liebermann reaction, and melted at about 250°. The ethereal solution was extracted first with water, taking out about 1 gm. of a gum, and then with potassium hydroxide, which extracted 3.5 gm. of acidic resin, leaving 2.5 gm. of neutral resin, from all of which nothing crystalline was obtained.

" Examination of the Chloroform and Ethyl Acetate Extracts: These extracts consisted of resins (4.0 and 11.0 gm. respectively) which were entirely amorphous. From the chloroform extract there separated gradually from the solution a quantity (1.6 gm.) of a fawncoloured material, but which was not obtained crystalline. Acetylation did not alter the amorphous nature of the product.

"Examination of the Alcohol Extract: This extract was concentrated to about 150 c.c. and water added. This precipitated about 15 gm. of a nearly black tar which was rejected.

"The clear aqueous liquor was treated with an excess of lead subacetate, the precipitate filtered, and the lead removed from the precipitate and the filtrate in the usual way. The concentrated liquid from the former gave a nearly black colour with ferric chloride and contained *tannin.* The concentrated liquid from the filtrate reduced Fehling's solution, and contained much sugar. In order to extract from the syrup any constituents soluble in alcohol, it was evaporated to complete dryness, using successive portions of alcohol, and then finally it was digested on the water-bath with successive portions (9 of about 50 c.c. each) of absolute alcohol. Each fraction was poured off from the syrupy residue while hot and then when cold was poured off from a small amount of separated syrup, which was returned to the larger bulk. Crystals separated from each fraction, but only a small quantity appeared in the last. The whole amount was accumulated, it weighed about 6 gms. in a crude condition, and it was recrystalised by dissolving in the smallest possible quantity of water, and the addition of alcohol, followed by concentration.

"In this way a substance separated in nearly colourless lustrous prisms, which melted with decomposition at 242°, this temperature being unaltered by recrystallization.

"The substance was anhydrous, and contained nitrogen.

"A number of analyses were carried out on the substance, it was very difficult to obtain accurate results, owing to its very sudden decomposition when heated, but by intimately mixing with a considerable proportion of powdered copper oxide, the following best analyses were obtained.

0·1324 gave 0·2402 CO_2 and 0·0838 H_2O. Hence $C=49·5$; $H=7·9$.
0·1474 gave 12·6c.c. N at 17° and 746 mm. Hence $N=9·7$ per cent.
$C_6H_{11}O_3N$ requires $C=49·6$; $H=7·6$; $N=9·7$ per cent.

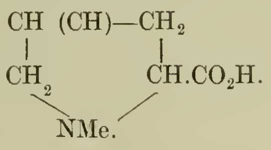
"The substance possessed little, if any, taste, was acid to litmus, but could not be titrated. It gave a strong pyrrol reaction, and yielded a copper salt.

"A quantity (0.2 gm.) of the substance under examination was dissolved in water, and excess of powdered copper oxide added, the mixture boiled for 6 hours, after which it was filtered and concentrated. Blue prisms separated, which were dried on porous tile, wasted with 70 per cent. alcohol, and then dried in air.

0·1021 lost 0·0200 H_20 at 110°. Hence $H_2O=19·6$ per cent.
$C_{12}H_2$ O O_6N_2 Cu. $4H_2O$ requires $H_2O=17·0$ per cent.
$5H_2O$ requires $H_2O=20·4$ per cent.
0·0669 (dried salt) gave 0·0146 CuO. Hence Cu.=17·4 $C_{12}H_{20}O_6N_2$ Cu. requires Cu.= 18·1 per cent.

"In view of the small amount of material the apparent discrepancy in the analyses with the required figures, is not surprising.

"This compound is an amino-acid, in all probability a methyl-hydroxy-proline. No such compound has been found to occur naturally hitherto, but Leuchs & Felser (Ber., 1908, 41, 1733) have synthesised two stereoisomeric methyl-hydroxy-prolines having the formula



both of which are similar to the substance described above, but differ from it slightly in some physical properties.

"A little of the original bark which had been extracted with alcohol was warmed with water. A pale solution was obtained, which possessed no taste, contained no tannin, and gave only a trace of a precipitate with lead subacetate solution. Fehling's solution was not reduced either before or after hydrolysis."

Further supplies of this bark have been asked for so that the investigation may be completed.

Bulbine latifolia: This plant is continually being submitted to the Division as being of medicinal value, especially as a blood purifier and also as a remedy for rheumatism and lumbago. Material of the roots of this plant obtained from the Somerset East District of the Cape Province were submitted to the Wellcome Research Bureau and examined in the Wellcome Chemical Laboratories by Dr. Pyeman, who furnished the following report on the same:—

"The total weight of the roots received was 2130 gm. and the whole quantity was sliced and dried. A quantity (about one-third of the whole) was found to be black and decomposed, and was rejected. The total weight of dried and ground material was 205 gm. Allowing for the rejected material therefore, the estimated weight of dried root would be 280 gm. which indicates the approximate loss of 85 per cent. of water by drying.

"A test for an alkaloid gave a negative result.

"A quantity (144 gm.) was successively extracted in a Soxhlet apparatus with the following solvents:—

Petroleum Ether (b.p. 35-60°) extracted	1·96 gms. =	1·36%
Ether extracted	1·18 gms. =	0·82%
Chloroform extracted	2·18 gms. =	1·51%
Ethyl Acetate extracted	2·40 gms. =	1·67%
Alcohol extracted	31·40 gms. =	21·81%
Total extracted	39·12 gms. =	27·17%

"Examination of the Petroleum Extract: This extract amounting to 1.96 gm. was digested with ether, when a small amount (about 0.05 gm.) was found to be sparingly soluble. This was of a golden yellow colour, and when dissolved in ethyl acetate and the solution concentrated, separated rosettes of needles. It was most probably not homogeneous when completely separated and could not be further characterised. However, the substance was insoluble in ammonia solution, soluble with a red colour in potassium hydroxide, and dissolved with a striking green colour in strong sulphuric acid. The portion of the extract soluble in ether was successively extracted with various alkalis. Only traces of material were taken out by ammonium carbonate and sodium carbonate but potassium hydroxide took out a substance giving a deep red solution, but which however, when acidified separated a black amorphous substance (0. 2 gm.) which could not be obtained crystalline. A small portion was boiled with acetic anhydride, but only an amorphous product resulted. The neutral portion (1.3 gm.) was hydrolysed with alcoholic potassium hydroxide, the alkaline liquid concentrated, water added, and the resulting mixture extracted with ether. By these means, there were obtained about 0.3 gm. of a mixture of crude fatty acids which appeared to be entirely acid, and 0.5 gm. of an oily unsaponifiable matter, which on keeping separated a crystalline substance in small amount which gave a phytosterol reaction.

"Examination of the Ether Extract: This resinous extract (1.18 gm.) was digested with ether, and completely dissolved. The solution was extracted with sodium carbonate and potassium hydroxide solutions, both of which gave a deep red colour. Both extracts were separately acidified and extracted with ether, and both yielded a quantity of nearly black insoluble powder, together with small amounts of an ether soluble substance, which when dissolved in ethyl acetate and concentrated separated small bright red crystals in the form of rosettes of needles. These when left in contact with the solvent turned brown, and became then insoluble probably indicating oxidation. A solution of the substance in dilute alkali dyes calico a dirty reddish brown colour.

"Examination of the Chloroform Extract: This extract yielded extracts with alkalis similar to those from the ether extract. These alkaline solutions however, when acidified did not yield a crystalline substance, probably owing to the simultaneous extraction of resinous matter.

"Examination of the Ethyl Acetate Extract: This consisted of a nearly black resin (2.14 gm.) which was amorphous, and nothing crystalline was obtained from it.

"Examination of the Alcohol Extract: This amounted to 31.4 gm. and when kept in dilute S.V.M. solution deposited 1 gm. of crude potassium chloride. This was removed, and the remainder much diluted with water, when 11.1 gm. of black amorphous resin were precipitated. The aqueous soluble portion amounting to 19.3 gm. was treated with an excess of lead subacetate. The liquid from the decomposition of the lead salts was dark brown, and gave a nearly black colour with ferric chloride solution, indicating the presence of tannin.

"The filtrate from the lead precipitate, after the removal of the lead by hydrogen sulphide, was concentrated and yielded a brown syrup. This gave d-phenyl glucosazone (m.p. 210°).

"It is evident from this preliminary investigation of the roots of *Bulbine latifolia* that a proportionately considerable quantity of substances which are colouring matters, and possibly anthraquinone derivatives, are present. The amounts of material available, however, prevented a more definite result to the investigation."

Chlorocodon Whitei is a plant which occurs commonly in Natal, Zululand and Swaziland. The root is known to the natives as "Umondi," and is used by them for indigestion and also for creating an appetite.

Roots were submitted to the Wellcome Chemical Laboratories and examined with the following results:

"This material, consisting of the roots of *Chlorocodon Whitei* was received with a letter, ref. No. 476 of the 14th September, 1918, from the Chief of the Division of Botany of the Department of Agriculture of the Union of South Africa.

"In the notes extracted from the 'Reports of the Natal Botanic Gardens,' forwarded with the letter, it was stated that the roots are aromatic and are used by the natives as a tonic.

"The roots of *Chlorocodon Whitei* have already been examined by Messrs. Goulding and Pelly, who have recorded that they contain an aromatic substance somewhat resembling a mixture of vanillin and heliotropin in odour and which they have identified as *para-methoxysalicylic aldehyde*, which is isomeric with vanillin (Proceedings of the Chemical Society, 1908, p. 62, and 1911, p. 255).

"The present sample weighed only about 100 grams and was therefore too small for examination in detail. It was compared with the roots examined by Messrs. Goulding and Pelly, which came from Uganda, and there is ittle doubt that the two materials are identical.

"The sample was subjected to preliminary examination and found to yield the following percentages of extracts to the solvents named, applied in succession to the ground roots:

"Light petroleum, 1.9; chloroform, 0.8; ether, 1.0; alcohol (95%), 18.0

"Each of these extracts was carefully fractionated so far as the small quantity of material available permitted, but apart from the aromatic substance isolated by Messrs. Goulding and Pelly no well-defined substance could be separated from them. It does not seem likely, therefore, that Umondi roots contain anything else of special interest. The roots would be of no value as a source of *para*-methoxysalicylic aldehyde, as there is at present no demand for this material, and if it were required it could readily be prepared synthetically."

Alepedia amatymbica, E. and Z.: The roots of this plant are commonly known as "Kalmoes Root," and are not infrequently used as a purgative and as a remedy for colic.

Material was sent to the Wellcome Chemical Laboratories, where it was examined and reported upon as follows:

"The sample weighed about 5 lbs., and consisted of pieces of root varying from 1 to 3 inches in length. The roots were white internally when freshly cut, but the cut surface soon became brown on exposure to air. The roots had a slight odour recalling that of parsley.

"The roots were ground to a fine powder and when extracted with solvents in the following order gave the following yields of extract:

"Light petroleum, 8.1; ether, 1.4; chloroform, 0.3; ethyl acetate, 1.7; alcohol (95%), 17.5 per cent.

"Each of these extracts was carefully fractionated in turn, but nothing definite could be separated from any of them.

"A second quantity of the ground roots was then exhausted with 95 per cent. alcohol and the extract, so obtained, carefully fractionated with solvents, but in this case also no definite substance could be isolated. It seems clear therefore that the roots of *Alepedia amatymbica*, as represented by this sample, contain nothing likely to repay detailed investigation. It would be interesting to know whether there is any trustworthy evidence available from medical men in South Africa, as to the medicinal value of these roots."

(*h*) *Noxious Weeds.*

It is pleasing to report that no new noxious weeds of a serious nature have come under our notice during the past twelve months. *Tagetes minuta*, L., however, continues to spread throughout the Union and is causing considerable alarm to the farming community. The weed is proclaimed in many parts of the Union, but I am convinced that it has become far too widely distributed throughout the length and breadth of the country to be brought under control by any practical means which can be resorted to by man. Even in those areas where the weed is proclaimed, the work of destruction is usually proceeded with far too late in the season to be effective, for the plant has more often than not matured its seeds and shed them before it is tackled. Unless the plant is actually rooted out and destroyed before it reaches the flowering stage, seed production will not be prevented, mere cutting down the plants either before flowering or during the flowering period only results in further growth and subsequent seed formation.

Four plots of heavily infested land were sprayed at the Botanical Laboratories during the past season, when it was found that sodium arsenate 4 ozs. to 4 gals. water and sodium arsenite 1 oz. to 6 gals., were both effective in destroying the plants. Similar plots sprayed with copper sulphate 3 lbs. to 13 gals. water and iron sulphate 2 lbs. to 3 gals. water were unaffected.

Some eight coloured illustrated pamphlets were prepared by Miss Lansdell and published during the period under review. The subject matter of these bulletins has also been revised and put into simple words for translation into native languages, so as to render them suitable for distribution amongst the native population.

The weeds illustrated were:

Mexican Poppy, *Argemone mexicana.*
Burweed, *Xanthium spinosum.*
Dwarf Marigold, *Schkuhria bonariensis.*
Malta Thistle, *Centaurea melitensis.*
Cockle-bur, *Xanthium occidentale.*
Jointed Cactus, *Opuntia aurantiaca.*
Imbricate Cactus, *Opuntia imbricata.*
Khaki-weed, *Alternanthera Achyrantha.*

II. NATIONAL HERBARIUM.

Dr. E. Percy Phillips took charge of the National Herbarium on the 1st of July, 1918. At that time the Herbarium contained approximately 8,000 mounted sheets. Since then much of the unmounted material has been worked over and some 5,724 sheets mounted. During the year 6,844 specimens were received at the Herbarium and some 910 determinations made for correspondents and collectors. The Herbarium acquired by purchase the whole of Miss Pegler's collection of Kentani plants, and Madame Dieterlen of Basutoland has very generously promised to donate the whole of her fine collection of Basutoland plants to the National Herbarium.

At the beginning of December the collections of phanerogamic plants which had hitherto been stored in a number of scattered rooms and passage ways in the main laboratory were moved into a new temporary building. This building is far too small to even house the present collections, and Dr. Phillips is continually drawing my attention to the unsatisfactory state of affairs existing in the Herbarium through the congestion of material and lack of proper working space. Not only do I fully realise the difficulties under which he is working, but I foresee grave risks from fire when a number of assistants are compelled to work under such circumstances. I have drawn your attention to these matters again and again, but in vain.

Dr. Phillips in his last report to me on the subject writes as follows:—

"The collection, excluding the Galpin herbarium is kept in 52 cabinets which are already so full that it is imperative more should be acquired. The Galpin collection is preserved in 14 cabinets of Kew pattern and there is no further space here either for expansion. Under present conditions our specimens are being spoilt by being too tightly packed away. The specimens mounted during the year, numbering close on 6,000 sheets cannot be incorporated in the general collection owing to lack of space. I see no prospect of altering this unsatisfactory state of affairs which will become more acute when we receive the Basutoland collection, and when specimens come in from the various representatives of the Botanical Survey in large numbers it will be impossible to deal with them. Even at the present rate we can do no more than mount specimens and lay them aside pending the time when more room is available. A number of book-shelves erected for a botanical library are utilised for stacking specimens and unless this state of things is remedied the Herbarium staff will be able to do no more than name specimens for correspondents and all scientific work will be suspended."

Dr. Phillips prepared the following botanical papers during the year:—

"(1) A Monograph on the Genus *Borbonia;* (2) A Monograph on the South African material of *Sesbania*; (3) The Natal *Sapindaceae* in the Natal Herbarium; (4) A list of the plants found in the Komgha District; (5) A preliminary Report on investigations at Groenkloof in connection with Veld-burning; (6) The collecting of Botanical Specimens and the making of a Herbarium; (7) A note on the Flora of the Great Winterhoek Range; (8) A Departmental Bulletin, Local Series No. 71."

A paper entitled "The Genus Fagara" was also prepared by Miss I. Verdoorn, under Dr. Phillips' guidance.

III. BOTANICAL MUSEUM.

The foundations of a first class botanical museum have been established under the care and supervision of Miss Lansdell. The museum at present contains some 513 botanical specimens, chiefly of economic interest, and includes specimens of oils and fats, dyes, human foods, paper-making plants, poisonous plants, medicinal plants, plants suitable for brush and basket making, fibre and cordage plants, noxious weeds and parasitic plants.

IV. LIBRARY.

The most important acquisition to the library during the year was the valuable collection of botanical works purchased from Mr. E. Galpin. The works practically all relate to phanerogamic plants and include a number of rare and valuable volumes, of which the following are worthy of special mention:—

Curtis' Botanical Magazine: A perfect set from the beginning in 1787 to 1910, bound in half morocco, all original editions, the earlier numbers being hand coloured.

Mrs. A. E. Roupell: *Specimens of South African Flora by a Lady.* 9 Plates, beautifully painted in water colours with descriptions by W. H. Harvey. Very rare, only 60 copies printed.

A. P. de Candolle—Un Histoire Naturelle des Plantes Grasses: avec figures designees par P. J. Redoubte et decrites par A. P. de Candolle. 2 Vols., 1799. Very rare.

E. Boissier, Icones Euphorbiarum: 120 plates with descriptions, 1866.

N. J. Jacquin—Platarum Rariorum Horti Caesarei Schoenbrunnensis: 500 coloured plates, hand painted, 4 vols., 1797-1804. Extremely rare. A very valuable work.

N. J. Jacquin—Icones Plantarum Rariorum: 648 hand painted plates, with descriptions, 5 vols., 1781-1793. Also extremely rare.

H. C. Andrews—The Heathery, or a Monograph on the genus *Erica*: 6 vols., 2nd edition, 1845.

L. Pappe—Silva Capensis: 1845; *Florae Capensis Medicae Prodromus*: 1850.

W. Sonder—Beitrage zur Flora von Südafrika.

C. P. Thunberg—Dissertatia Botanico de Erica.

F. Masson—Stapeliae Novae Descriptiones: 1796. Very rare.

Salm-Dyck—Monographia of *Aloes* and *Mesembryanthemi*: 2 vols., 1836-1863. A very valuable and rare work.

N. J. Jacquin—Oxalis Monographia.

S. Edwards—The Botanical Register: 33 vols., complete. A very valuable work.

W. H. Harvey—Thesaurus Capensis: 2 vols.

H. W. Buek—Index Generalis et specialis: ad A.P. de Candole Prodramum Systematis naturalis Regni vegetabilis. This index is very rare and almost unprocurable.

J. G. C. Lehmann—Pugillus Sextus Novarum et minus cognitarum stirpium. This rare work contains Lehmann's descriptions of South African Cycads.

A. H. Haworth—Synapsis Plantarum Succulentarum: 1812.

The whole collection comprises 300 volumes besides many small pamphlets and offprints; the majority of these dealing exclusively with the South African Flora, and is a great acquisition to our Botanical Library.

In addition to Mr. Galpin's Library, the following books have been acquired during the year:—

"The Preservation of Wood" by A. J. Wallis..
"Tidal Lands" by Alfred E. Carey.
"The Development and Structure of Vegetation" by F. E. Clements.
"Practical Organic and Bio-Chemistry" by R. H. A. Plimmer.
"Annual Reports of the Smithsonian Institution".
"Monthly Microscopical Journal and Transactions of the Royal Society," Vols. 1-18.
"The Grasses and Grass Lands of South Africa" by J. W. Bews.
"Histology of Medicinal Plants" by Wm. Mansfield.
"Dictionary of Plant Names" by Rudolph Marloth.
"The Flora of South Africa", Vols. I and IV, by Rudolph Marloth.
"A Text Book of Mycology and Plant Pathology" by Harshberger.
"Fundamentals of Botany" by C. Gager.
"History of Phytopathology," by G. H. Whetzel.
"The Botany of Crop Plants" by W. W. Robbins.
"Palladin's Plant Physiology" by V. Palladin.
"Manual of Fruit Diseases" by Lex Hesler.
"Zakflora" by H. F. R. Suringer.
"Textile Fibres of Commerce" by Wm. Hannan, and the
"The Essentials of Illustration" by T. G. Hill.

V. BOTANICAL SURVEY.

Towards the latter part of 1917, the Scientific and Technical Committee urged the Government to undertake a Botanical Survey of the Union—a matter which had long been advocated by this Division. The question of the organisation of such a survey was referred to this Division, and I suggested that the matter should first of all be thoroughly discussed at a meeting of Government botanists and other government officials interested. A meeting at which officers of this Division, the Division of Veterinary Research, the Forest Department and Schools of Agriculture were present, was held on the 18th February, 1918, when it was unanimously decided that the aims and scope of the Survey should be:—

I. To continue and extend the survey and systematic work already carried out by the Division of Botany on the vegetation of the country.

II. To continue and extend the survey work already carried out by the Division of Veterinary Research on the relation of such vegetation to the unsolved stock diseases of South Africa.

III. To continue and extend the collections of the plant parasites of the indigenous vegetation already made by the Division of Botany, and proceed with its examination as a possible reservoir of diseases of cultivated plants and of domesticated animals, and in particular map their distribution.

IV. To continue and extend the work already accomplished by the Forest Department in further ascertaining the composition of the indigenous forests, the value of their products, and their industrial possibilities.

V. To study the vegetaton from an industrial point of view.

VI. To study the vegetation in its relation to agricultural and pastoral developments.

VII. To study the plant succession under natural and artificial conditions.

VIII. To study the vegetation of the veld in connection with its feeding value and carrying capacity and distinguish botanically between "sour" and "sweet" velds, good and bad pastures.

IX. To study the disturbing influence of burning, manuring, cultivation, drainage, irrigation, overstocking, insect and plant pests on the natural vegetation.

X. To study plant distribution according to geological, orographical, and climatological conditions and the conditions which influence the different plant formations.

XI. To extend our knowledge of the medicinal and poisonous plants of the country.

XII. To study the influence of South African conditions on the structure and physiology of our plants and in particular the causes which give rise to non-parasitic diseases.

XIII. To compare and correlate our flora and its associated animal and plant diseases with those existing in other parts of the world under somewhat similar telluric and climatic conditions.

XIV. To devote more attention to the soil and its micro-organisms.

It was further unanimously agreed that the best means of carrying out such a survey and of securing proper organisation, co-ordination and co-operation between Government Departments concerned and voluntary workers were:

I. That the survey should fall under the direction of the Chief Botanist of the Union, assisted by a small Advisory Committee consisting of not more than five members and of representatives of Government Departments interested.

II. That the country should be split up into a convenient number of botanical areas, each of which should be controlled by a botanist for that region and who should be responsible to the Director. All voluntary workers in each area to be responsible to the Botanist in charge, so that co-ordination is obtained and overlapping prevented.

III. That the survey should be carried out by Government officers as well as by voluntary workers, provided they are not put to any pecuniary loss, and that rail warrants for travelling and expenses in connection therewith be furnished and paid by the Director of the Survey from funds provided for the purpose.

IV. The seat of the Central Herbarium, with all the necessary types and records, should be established at Headquarters, under the direct supervision of the Director of the Survey, and Regional Herbaria should be kept in the different botanical areas under the Botanist in Charge.

V. That provision be made for the necessary qualified assistants at the Central Herbarium to deal with the plants and records submitted from the Regional Herbaria.

VI. That the necessary arrangements be made with the Director at Kew—where for some years a Botanical Survey of the Empire has been in progress—whereby the services of a qualified assistant could be wholly devoted to the critical examination of the plants submitted.

VII. That the objects and furtherance of the survey can only be obtained by the preparation and publication of regional floras, local floras, check lists and all other subject matter of interest.

VIII. That these should be issued when considered advisable as Government publications under the direction of the Director of the Survey as "Memoirs of the Botanical Survey of South Africa."

IX. That the existing University Colleges and Museums should be made use of for the study of the morphological, histological and physiological problems connected with the peculiar conditions observed in South African vegetation.

X. That the personnel of the Advisory Committee should be composed of:

(1) Dr. Marloth, Cape Province; (2) Dr. Schonland, South-Eastern Area; (3) Dr. Bews, Natal; (4) Prof. Potts, Orange Free State; and (5) A representative of the Technical and Scientific Committee.

The Minister approved of this scheme and the Scientific and Technical Committee were invited to nominate a representative on the Survey Advisory Committee. This, however, they declined, and the Minister in response to the wishes of the Survey Advisory Committee appointed Mrs. Bolus to the vacant seat on the Committee.

The Advisory Committee for the Botanical Survey of the Union was thus constituted as follows:

I. B. Pole Evans, M.A., D.Sc., F.L.S., Chief, Division of Plant Pathology and Botany, and Director of the Survey.
Prof. J. W. Bews, M.A., D.Sc., Natal University College.
Mrs. L. Bolus, B.A., South African College, Cape Town.
Dr. R. Marloth, M.A., Ph.D., Cape Town.
Prof. G. Potts, M.Sc., Ph.D., Grey University College, Bloemfontein.
Prof. S. Schonland, M.A., Ph.D., Rhodes University College, Grahamstown.
C. E. Legat, B.Sc., Chief Conservator of Forests.
E. R. Montgomery, M.R.C.V.S., Director of Veterinary Research.

Two meetings of the Advisory Committee have been held during the year, one in Pretoria, the other in Cape Town. As a result, the country has been divided up into five administrative areas, *viz.*:

1. The South Western Area under Dr. Marloth.
2. The South Eastern Area under Prof. Schonland.
3. The Eastern Area, including Pondoland, Natal and Zululand, under Prof. Bews.
4. The Orange Free State and Basutoland under Prof. Potts.
5. Griqualand West and all the country north of the Vaal River under the direct supervision of the Director of the Survey.

Up to the present the meetings of the Advisory Committee dealt chiefly with details in connection with the organisation of the survey, and considerable progress has been made with these matters.

VI. Mycological Work.

Miss Bottomley, B.A., was in charge of the mycological herbarium during the year. During this time some 967 specimens were added to the herbarium. They were registered, mounted, labelled and filed away. In order to obviate the overcrowding of specimens which had taken place, the entire number of specimens, amounting to nearly 12,000, and their duplicates had to be moved during the year. This, together with the necessary re-arranging and re-labelling, occupied a considerable amount of time.

Dr. Doidge has written a number of short papers, chiefly on the *Perisporiaceæ*, which have been read before the Royal Society of South Africa, and in which a number of new species have been described. The Herbarium has received a large number of valuable exchanges, particularly from Prof. C. F. Baker in the Phillipines and Prof. F. L. Stevens.

Dr. Doidge has made microscopic preparations from all the latter collection as well as from specimens collected locally. The collection of slides of the *Perisporiales* and *Hemisphæriales* now numbers nearly 1,000.

Dr. Doidge has also commenced work on the *Dothideales* in the Herbarium.

VII. Pathological.

The routine work and ordinary advisory work of the Division in connection with correspondence and specimens submitted for examination has been heavy, and has taken up a large proportion of time which otherwise might have been devoted to research. No new diseases of any great importance were observed during the period under review, but owing to the early rains an extraordinary heavy epidemic of *Exoascus deformans*, Fck. occurred almost throughout the Union, and resulted in a very great number of specimens being sent in for identification from all parts of the country.

Citrus Canker: The eradication campaign against this disease has been vigourously continued during the past twelve months and good progress has been made. There is every reason to believe that the spread of the disease has been definitely checked.

During the period under review new outbreaks were discovered on five farms in the Transvaal.

The farms are:

(1) Roodekopje, No. 44, Pretoria District; (2) Elandsdrift, No. 284, Rustenburg District; (3) Roodekopjes, No. 171, Rustenburg District; (4) Spruitfontein, No. 349, Rustenburg District; and (5) Nylstroom Town Lands, Waterberg District.

Up to March 31st, 1918, canker had been found on three farms in the Cape Province and on 27 farms in the Transvaal.

During the twelve months ending March 31st, 1919, canker was detected on one farm in the Cape Province and on 21 farms in the Transvaal. The farms on which the disease occurred were:

Cape Province: (1) Cavers, Bedford.

Transvaal.—Pretoria District: (2) De Kroon, No. 420; (3) Hartebeesthoek, No. 524; (4) Klipdrift, No. 87; (5) Krokodilpoort, No. 411; (6) Middelkopje, No. 365; (7) Roodekopjes, No. 44; (8) Schoongezicht, No. 557; (9) Vissershoek, No. 45.

Rustenburg District: (10) Bokfontein, No. 647; (11) Buffelsfontein, No. 558; (12) Buffelshoek, No. 900; (13) Buffelspoort, No. 668; (14) Elandsdrift, N. 284; (15) Groenkloof, No. 418; (16) Kaffirskraal, No. 915; (17) Rietfontein, No. 431; (18) Roodekopjes, No. 171; (19) Spruitfontein, No. 349.

Waterberg District: (20) Nylstroom Town Lands; (21) Roodepoort, No. 2148; (22) Zandfontein, No. 258.

Owing to the steps which have been taken during the past twelve months to deal with the disease on the above farms, the following are those which are still considered dangerous:

Transvaal.—Pretoria District: (1) De Kroon, No. 420; (2) Hartebeesthoek, No. 524; (3) Schoongezicht, No. 557; (4) Vissershoek, No. 45.

Rustenburg District: (5) Bokfontein, No. 647; (6) Buffelsfontein, No. 558; (7) Buffelspoort, No. 668; (8) Buffelshoek, No. 900; (9) Elandsdrift, No. 284; (10) Kaffiirskraal, No. 915.

Waterberg District: (11) Roodepoort, No. 2148.

Mr. G. Hobson, Chief Canker Inspector, reports on formalin spraying experiments as follows:

" Soil Disinfection: Experiments in soil disinfection with formalin were carried out in the orchard of Mr. L. N. Fourie, De Kroon. This is a valuable orchard which contained 1,566 exceptionally well-grown, dense and low-growing budded trees. It is situated in a humid locality and in every respect is one in which it was considered almost impossible to successfully combat canker without sacrificing the whole orchard.

This orchard was divided into three blocks, A. and B., and an adjoining infected orchard, C., was used as a control.

" The method used was as follows: The soil was thoroughly wetted to a depth of three inches with formalin (1 part to 9 parts of water), and was then turned over to a depth of 4—5 inches and again treated with formalin. A rake was then used to level off the soil and break up any lumps.

“ *Block A.*: All sites on which diseased trees had stood were treated with formalin on the 10th August, 1918, and again on the 20th of the same month. During September all these sites were given a third spraying and also the soil under and around all trees in the block. During March, 1919, every tree in Block A. was sprayed with formalin, 1—100, and the practice of spraying contact trees with this dilution has been continued up to date.

“ *Block B.*: In this block only the sites where diseased trees had actually stood were treated with formalin.

“ *Block C.*: No treatment until March, 1919, when sites of diseased trees and contact trees were sprayed.

“The number of trees found infected in each block from March, 1918, to April, 1919, was as follows:

Block A., 62; Block B., 40; Block C., 41.

These figures do not appear encouraging, but I am convinced that had formalin not been used the disease would have spread right through Block A. Spraying of sites from which newly diseased trees have been removed and of contact trees is being continued in this block.

“ It must also be borne in mind that the trees in Blocks A. and B. are exceptionally large, and the foliage very dense; consequently it is almost impossible for inspectors to detect in every case, say a single diseased leaf on any one tree. It has happened several times that some very slight infection has been overlooked, and that this has given rise to heavy fresh infections when the weather conditions have been favourable.

“ Spraying with formalin for soil disinfection and for spraying contact trees might be carried out more extensively in infected blocks, but the present price of formalin, 26s. per gallon is prohibitive. At this rate the cost of spraying 12 square yards of soil is 120s.

The chief investigations carried out on phytopathological problems during the year were:—

1. *Citrus Canker*: Dr Doidge in addition to the large amount of routine work which involved the examination of some thousands of specimens submitted from time to time by the citrus canker inspectors continued her study of the citrus canker organism—*Bacterium citri* (Hasse), and succeeded in recovering the organism from the soil of three infected orchards. She has also undertaken a comparative study of four organisms belonging to the so-called “Yellow *Pseudomonas* group,” viz.:—*Bacterium citri*, *B. juglandis*, *B. Phaseoli* and *B. campestre*.

2. *Cotton Bacterial Spot*: In connection with the above comparative study Dr. Doidge has also had under investigation during the year *Bacterium malvacearum*, which has become somewhat prevalent on cotton in certain parts of the Transvaal, Natal and Swaziland.

3. *Wheat Smut*: A smut on wheat due to the fungus *Urocystis* was submitted in November from Zeerust in the Transvaal. It was stated that considerable damage had been done to the crop through this disease, which had not yielded to seed treatment. The fungus attacks both ear, stems and leaves, forming elongated streaks on the two latter. The disease is being investigated by Miss Bottomley, B.A.

4. *Kikuyu Grass Blotch*: A species of *Helminthosporium* was isolated from infected leaves, but inoculation of healthy leaves with the fungus failed. Miss Bottomley, who carried out the investigation, is of opinion that the grass only succumbs to attack when grown under unfavourable conditions.

5. *Cupressus Disease*: Miss Bottomley has completed an investigation of the dying-off of *Cupressus macrocarpa* hedges and *Cupressus* seedlings, and has shown that this disease is due to a species of *Phoma*. She found that the spores of the parasite were affected by copper sulphate to the extent of one part of the salt to 10,000 parts of water; and that spraying with Bordeaux Mixture was effective. Miss Bottomley has prepared a paper entitled “A preliminary investigation into a fungus disease attacking young *Cupressus* spp.”

“ *Fairy Rings on Bowling Greens*: Several complaints were made during the past season with regard to the disfigurement and damage to bowling greens on account of Fairy Rings. The matter was investigated by Miss Bottomley who attributes the trouble to the presence of the fungus *Lycoperdon furfuraceum*, which also occurs in Australia under very similar conditions.

7. *Walnut Bacteriosis*: Mr. V. H. Putterill, M.A., conducted a series of spraying experiments against this disease in the Orange Free State, but the experiments will probably need repeating for at least a couple of seasons before any definite conclusions can be formulated.

8. *Almond and Apricot Die-Back*: This trouble has been very prevalent in the Western Province of the Cape for a number of years. One of the main limbs of these trees suddenly wilts in the springs and dies back. The matter is being investigated by Mr. Putterill, M.A., who has isolated a fungus from infected tissues which proves to be a species of *Schizophyllum*. The adoption of more sanitary measures in the orchards is likely to prove effective in reducing the incidence of the disease.

9. *Red Rot of Sugar Cane*: Dr. van der Bijl, has devoted attention to this trouble in Natal, and has submitted the results of his investigations for publication.

10. *Paw-Paw Leaf Spot*: The investigation of this trouble was continued by Dr. van der Bijl, in Natal, and a bulletin dealing with the disease has been published.

11. *Rhenoster Bush Disease*: Large areas of rhenoster bush were observed by the farmers in the neighbourhood of Grahamstown to be dying off and the matter was referred to the Department. I visited some of the affected areas in May, 1918, and after some preliminary investigations on the spot came to the conclusion that the plants were being killed off by a parasitic fungus belonging to the genus *Polyporus*. The investigation was placed in the hands of Miss King, B.A., whose examination of affected material left little doubt regarding the cause of the trouble. The necessary innoculation experiments and further investigation of the disease could not, however, be continued at the time, as the Division was still without any greenhouse accommodation which is essential for such work. Miss King resigned her position in the Division in December and the investigation has been in abeyance ever since.

12. *Decay of Fruit in Cold Stores*: Our attention was drawn by one of the leading fruit growers in the Cape Province to the heavy wastage of fruit that was occurring in the various cold stores in the Union. Apples in particular were said to undergo a high percentage of decay. A preliminary investigation as to the cause of the trouble was carried out by Dr. Doidge, who found that the atmosphere in the cold storage chambers examined was heavily charged with putrifactive organisms capable of causing rot in fruit which has suffered from the slightest mechanical injury.

Suggestions were accordingly made for preventing the occurrence of the rot. These were to the effect that more care should be exercised in picking and handling the fruit in the orchard and also in selecting fruit for packing, that greater attention and care should be paid to the actual packing of the fruit, and that regular disinfection of cold storage chambers should be carried out with formalin. The attention of the various cold stores in the country was drawn to the matter, and all at once expressed their readiness to adopt our suggestions, and it is pleasing to report that fruit-growers have already realised the good accruing therefrom.

VIII. Natal Herbarium.

The scope of the Natal Herbarium, which was under the supervision of this Division from April, 1913, was, after Dr. Medley Wood's death, considerably enlarged by converting his dweling house into a pathological laboratory, where investigations regarding the diseases affecting sugar cane and other sub-tropical crops could be conducted. This laboratory has been equipped with up-to-date apparatus, is furnished with greenhouses, and is eminently suitable for such research work which Dr. van der Bijl, the Mycologist in Charge, is at present carrying out.

In addition to the Pathological Laboratory there is the fine building known as the Natal Herbarium, in which is stored the valuable collection of botanical specimens of Natal flora, and those of other parts of the world, got together by the late Dr. Medley Wood. Dr. van der Bijl is also in charge of the Herbarium.

IX. Publications.

The following articles were prepared by officers of the Division and published during the period under review:

I. By I. B. Pole Evans, M.A., D.Sc., F.L.S.:
  1. The Plant Geography of South Africa—Official Year Book, 1917.
  2. Note on the genus Terfezia; a truffle from the Kalahari—Trans. Roy. Soc. S. Africa, Vol. VII., Pt. 2, 1918.
  3. Citrus Canker in South Africa and its Eradication—South African Journ. of Industries, Jan., 1919.
  4. "Teff Rust"—Kew Bulletin, Nov., 1918, p. 228.

By I. B. Pole Evans, M.A., D.Sc., F.L.S., and Averil Bottomley, B.A.:
  5. An Enumeration of the Fungi collected at Kentani in the Cape Province by Miss Alice Pegler, A.L.S., from 1911—1914—The Annals of the Bolus Herbarium, Vol. II., pp. 185—193.
  6. On the genera *Diplocystis* and *Broomeia*—Trans. Roy. Soc. S. Africa, Vol. VII, Pt. 3, 1919, p. 189, Plates XIX—XXIII.

By I. B. Pole Evans, M.A., D.Sc., F.L.S., and K. Lansdell.
  7. The Malta Thistle—Dept. of Agric. Bull. Local Series, No. 35.
  8. The Bur-weed or Boete-Bosje—Dept. of Agric. Bull. Local Series, No. 36.
  9. The Mexican Poppy—Dept. of Agric. Bull. Local Series, No. 37.
  10. The Dwarf Marigold—Dept. of Agric. Bull. Local Series, No. 38.

II. By Ethel M. Doidge, M.A., D.Sc., F.L.S.:
Papers read before Royal Society of S.A.
April 17th, 1918—South African Perisporiaceæ, ii. Revisional Notes.
May 15th, 1918—III. Notes on Four Species of Meliola, hitherto unrecorded from South Africa.

June 19th, 1918—IV. New Species from the Coast Districts.
July 17th, 1918—Mycological Notes, I.
August 21st, 1918—*Meliocaster*, a new genus of the *Microthyriaceæ.*
October 16th, 1918—South African Perisporiaceæ, V. Notes on an Interesting Collection from Natal.

Papers read before the South African Association for the Advancement of Science, at the Johannesburg Session, July, 1918.

Walnut Bacteriosis.
A Bacterial Blight of Beans.
The Diagnostic Characters of Certain Superficial Fungi.

Departmental Bulletins:
General Series, Bull. No. 3., " The Characteristics of Citrus Canker and its Eradication."
Local Series, No. 49., " The *Rhizoctonia* Disease of Potatoes."
Local Series, No. 63., " Internal Brown Fleck."
In the Press, "Common Fungous and Bacterial Diseases of Plants in South Africa" (Chart with Illustrations).
Walnut Blight.

Published in the South African Fruit Grower:
Potato Diseases—
V. Bacterial Wilt or "Vrot-Pootje, June, 1918, Vol. IV., No. 12, p. 236.
VI. " The Rhizoctonia Disease of Potatoes "—July, 1918, Vol. V., No. 1, p. 6.
VII. " Late Blight or Irish Potato Blight "—September, 1918, Vol. V., No. 3, p. 47.
VIII. " Internal Brown Fleck "—November, 1918, Vol. V., No. 5, p. 94.
Walnut Blight—October, 1918, Vol. V., No. 4, p. 68.

By P. A. van der Bijl, M.A., D.Sc., F.L.S.:
1. " Fomes Applanatus (Pers.) Wallr. in S. Africa, and its effect on the wood of Black Ironwood Trees *(Olea laurifolia)*." Reprinted from the S.A. Jour. of Sc., June, 1918.
2. " A Cane Leaf Spot "—Dept. Bull. No. 10, June, 1918.

(Sgd.) I. B. POLE EVANS,
Chief: Division of Botany.

APPENDIX VI.

TOBACCO AND COTTON DIVISION.

The following changes have taken place in the staff during the year:—H. W. Taylor, Assistant Chief of the Division and Manager of the Rustenburg Experiment Station, resigned to accept a billet with the Rhodesian Government.

W. B. Wilson, Tobacco and Cotton Expert for Natal, resigned to accept a billet with the Ceylon Government.

H. J. Schuurman and C. B. Kohler, foremen at Rustenburg and Elsenburg, resigned. The resignation of Taylor and Wilson is the most serious loss that the Division has had to face. The situation is especially awkward because there are not trained men, available in the country to take their places.

During the period under review there were 3,862 letters and telegrams received and despatched at Head Office and 6,070 were dealt with by the district officers.

Officers of the Division published bulletins as follows:—

1. "Cotton and Cotton-seed products."
2. "Cotton Growing in South Africa."
3. "Seed selection of Turkish Tobacco."
4. "Tobacco—the effects of Soil and Climate, on the quality, etc."
5. "The production of Light-coloured Tobacco in the Vredefort and Potchefstroom districts.

An exhibit from the Division was placed on all of the principal Agricultural Shows held in the Union during 1918. Unfortunately, this work will have to be discontinued until additional men are secured to bring the staff up to meet the requirements of the country, as I find that taking the technical officers off their work during that period is a serious handicap for them throughout the season.

The tobacco crop will be somewhat curtailed on account of the influenza epidemic coming at a time when the farmers should have been transplanting. But in spite of this set-back the crop will be somewhere around 10,000,000 lbs. The last season's crop showed an excess of exports over imports. (Exports, 1,928,217 lbs.; imports, 645,300 lbs.).

The three Tobacco Associations at Rustenburg, Paarl and Parys had another successful year. Good prices were maintained and the demand for, especially cigarette leaf, was always strong.

The Association of Tobacco Societies held their second annual meeting in the Executive Council Chambers, Union Buildings, during the month of February, 1919, at which, delegates of the four Colonies were in attendance. Unfortunately, Rhodesia could not send representatives. There were a number of important matters pertaining to tobacco culture and marketing discussed. The question of an export market came in for a considerable amount of discussion as it is anticipated that when the Hartebeeste-Poort Dam is completed, there will be a large acreage under it, that will be utilised for tobacco culture, therefore, it is highly essential that a market be found for our surplus stock.

Cotton.—There are something like 12,000 acres planted to cotton in the Union this season, and the crop bids fair to be the best yet produced. If favourable weather continues we may expect at least 1½ millions pounds of seed cotton, this will be about double the size of previous crops. The crop is so promising that private enterprise is increasing the facilities for handling it. Another large ginning plant has been ordered for Natal, a ginning machine has been ordered for Swaziland, and two other ginning plants are under consideration for the Eastern Transvaal. I am reliably informed that a crushing plant for the manufacture of cotton seed oil and cake has been established near Durban. When such a plant is working up to full capacity it will be an important industry, and, it will be of considerable advantage to the cotton growers of the Union, as it will furnish a market for their entire surplus stock of seed.

Last season's cotton lint sold locally at 1s. 6d. per lb. for first grade, likewise a portion of the crop which was shipped oversea, was purchased f.o.r. Durban at 1s. 6d. per lb.

The price of cotton will, no doubt, drop lower than it is now, but I do not expect to see it below 1s. per lb. for first grade lint for several years, and at that price it will be a splendid paying crop.

The demand for both tobacco and cotton seed, grown under Government supervision, is so heavy that it is impossible for us to fill all the orders received. In the near future, I anticipate that we will be compelled to restrict the quantity of seed supplied to an individual; otherwise we will be letting the bulk of our seed to a few individuals, and the large number of farmers who want only a small amount will be left out.

The Chief of the Division and his Assistants find the demand on their time for field work very heavy. In fact, it is impossible for us to comply with all requests to come and give advice on the farm. Until the present vacancies on the staff are filled the position is bound to become still more awkward.

During the past years the members of my staff have been giving a series of lectures on Tobacco and Cotton culture at the Schools of Agriculture, both for the long course and the short course, but on account of heavy pressure of work which falls to the remnant of my staff I fear it will be necessary to discontinue this work for the present.

The work at the Experiment Stations consisted chiefly of:—

1. Green manuring experiments.
2. Seed selection.
3. Variety tests with Tobacco and Cotton.
4. Methods of curing tobacco.
5. Different methods of treating these crops.
6. Seed distribution.
7. Training students in farm operations.
8. Keeping daily records of temperature, rainfall, &c.

The Itinerant Officers have been busy visiting farmers and giving advice on the spot, conducting variety and fertilizer tests with the farmers; lecturing at farmers' meetings, and at the Agricultural Schools, conducting boys' club competition in tobacco culture, assisting the tobacco and cotton growers to form co-operative companies, acting generally in an advisory capacity to farmers, and especially those who are beginners. Placing an exhibit on the Agricultural Shows, and acting as judge at a number of them.

Rustenburg Experiment Station.—During the year the Manager received and despatched 847 letters and telegrams, the regular monthly returns and monthly reports. These monthly returns, etc., take up a considerable amount of the Manager's time, and they seem to be a constant bother, but I do not see how we are to avoid them.

There were 143 visitors at the Station during the twelve months.

Under the new apprenticeship scheme, since last July, we have had twelve students. The scheme is similar to that obtaining at Groot Constantia. The instruction is principally of a practical nature, although an occasional lecture is given to them. Generally speaking, the students are a good class of young men, and most of them take a keen interest in the work.

The cost of provision for each apprentice for the nine months, works out at £2 9s. 6d. per month.

The season, so far, has been a favourable one, and the crops give promise of being the best that have been produced for several years. The cotton is especially promising, the black turf, ratooned plot gives promise of yielding 1,000 to 1,200 lbs. of seed cotton per acre. These ratooned plots are being watched with special interest, as the advisability of recommending to the farmers this method of growing the crop as a perennial will have to be decided. The other crops on the Station, such as forage, beans, and maize, have made satisfactory progress. During February a small plantation of forest trees, containing about 3,000, has been established. They are beginning to make growth.

The old tobacco shed which stood in the corner of one of our principal plots has been removed, and the material used for constructing other necessary buildings, such as ginning room, dairy room and store-room.

Elsenburg Tobacco Station.—During the year the Manager received and despatched 788 letters and telegrams and the regular monthly returns and reports.

There were 195 visitors at the Station during the year.

The Manager is devoting a considerable amount of time to the question of seed selection and the creation of new varieties by hybridization. I am pleased to state that the results of these investigations, so far have been satisfactory. There is every promise that in the near future, we will have established pure strains, of a number of varieties, of Turkish tobacco which will be decidedly superior to the old ones.

The tobacco crop which has just been housed is, from all appearances, quite up to the standard of that of previous years, in so far as quality is concerned, and in addition to this, the crop will be from one-half to two-thirds larger than any previous crop. Taking into consideration the fact that the present Manager has devoted a lot of time to the question of improving the breeds, it is very gratifying that he was able to handle this larger crop so well.

The second annual meeting of the Turkish Tobacco Growers was held at Elsenburg on December, 21st, 1918.

Piet Retief Experiment Station.—During the year the Manager received and despatched 536 letters and telegrams, the regular monthly returns and monthly reports.

There were 199 visitors at the Station during the twelve months.

The Manager of the Station had to attend all of the principal Agricultural Shows to display the exhibit of this Division, consequently his work at the Station was considerably neglected. However, the tobacco crop is fair. The mealies, teff, and forage will give enough feed to supply our wants and have some left.

If we expect to continue this Station, it is highly necessary that we get a capable man and put in charge without delay; otherwise, the Station will fall into bad repute. It has already suffered in this respect.

There is considerable scope for this Station, but it must be tackled in earnest, if we expect it to be of the fullest possible value to the district and the country.

Itinerant Officers.—The Itinerant Officers in the Western District, Cape Province, the Orange Free State, and Natal received and despatched 475, 200, 3,224 letters and telegrams respectively, and in addition the regular monthly returns and reports.

The Turkish Tobacco Expert devoted practically the whole of his time to the supervision of the crops of beginners. The Tobacco and Cotton Expert in the Orange Free State in addition to ordinary itinerant work, conducted a Boys' Tobacco Growing Competition, which was very successful, and further he organised some of the tobacco growers into a Limited Liability Company, and supervised the operations of this Company. They handled approximately 300,000 lbs of tobacco, and comparing the price which they got for their crops, through the Company, with those they received before forming the Company shows an increased profit on the 300,000 lbs. amounting to approximately £4,000. It was with great reluctance that I took this officer off of the Free State work, and sent him to Rustenburg, as he was doing such good work in his former post.

The Tobacco and Cotton Expert in Natal, in addition to itinerant work, did the ginning of cotton for most of the Natal cotton growers. This line of work has grown to such dimensions that we will have to consider the question of only ginning for those farmers who are attempting to produce pure seed for re-seeding purposes. If we adopt this attitude, we will have to instruct the farmers that the main bulk of their crops must be dealt with at one of the Commercial Gins.

W. H. SCHERFFIUS,
Chief: Tobacco and Cotton Division.

ANNEXURE 1 TO APPENDIX VI.—TOBACCO AND COTTON EXPERIMENT STATIONS. STATEMENT OF RECEIPTS AND EXPENDITURE FOR THE YEAR ENDED 31ST MARCH, 1919.

Receipts and Expenditure.	Rustenburg.			Piet Retief.			Elsenburg		
Receipts.	£	s.	d.	£	s.	d.	£	s.	d.
Sales of Tobacco	154	1	7	102	13	9	270	5	5
„ „ „ Seed	26	0	6	3	13	0	25	11	0
„ Cotton Lint	107	17	6	—			—		
„ Livestock	76	4	9	66	10	0	—		
„ Machinery	—			20	0	0	—		
„ Other Seed	—			31	13	6	—		
Miscellaneous	37	18	2	—			—		
Total Cash Receipts	402	2	6	224	10	3	295	16	5
Transfers.									
Farm Produce	—			32	8	2	—		
Seeds	—			4	10	0	—		
Total *Receipts*	402	2	6	261	8	5	295	16	5
Expenditure.									
Salaries, Wages and Allowances	476	15	3	494	5	4	301	5	2
General Stores and Equipment	250	19	10	57	8	1	34	15	3
Implements, Repairs, &c.	38	10	4	43	5	0	4	16	7
Livestock	162	0	0	—			—		
Seeds	10	3	4	—			8	0	0
Manures	—			21	15	0	18	7	6
Feeding Stuffs	4	10	0	—			—		
Fuel	18	19	0	4	9	6	—		
Entertainment of Visitors	1	8	6	—			—		
Railage	19	1	7	22	8	2	22	17	8
Incidentals	29	16	1	10	10	0	6	7	6
Total Cash Expenditure	1,012	3	11	654	1	1	396	9	8
Transfers.									
Seeds	4	10	0	1	11	6	—		
Farm Produce	0	8	0	—			1	11	8
Total *Expenditure*	£1,017	1	11	655	12	7	398	1	8

APPENDIX VII.

DIVISION OF HORTICULTURE.

Changes of Staff, etc.—On the 1st October, the writer left Elsenburg to take charge of the Horticultural Division as Acting Chief, on the retirement of Mr. R. A. Davis. Mr. N. H. Shaw was transferred from Grootfontein, to Elsenburg on the 8th September, whilst Mr. G. Marshall, Assistant Horticulturist at Elsenburg, was transferred to Grootfontein, as Horticulturist there. Mr. H. B. Terry is still Horticulturist at Potchefstroom and Mr. G. Terry at Cedara, whilst Glen is being attended to as occasion requires by Mr. Marshall, as it had been in the early part of the year by Mr. Shaw, from Grootfontein. The orchard at Glen is small and still young and thus requires very little technical attention, excepting at pruning and spraying periods. In December, Mr. Perkins was appointed assistant to Mr. Shaw at Elsenburg, and Mr. Schoeman from Cedara was appointed assistant to Mr. Terry at Potchefstroom. Mr. le Sueur is still itinerant horticulturist stationed at Grahamstown and working the districts in the eastern Province. He has pointed out on several occasions that Port Elizabeth would be a more suitable centre from which to work. In this I quite concur. Uitenhage, Humansdorp, Longkloof and Sunday's River are becoming the principal centres in that area, with Port Elizabeth right in their midst.

In March the Government Experimental Citrus Orchard at Warmbaths was doomed to be destroyed under Citrus Canker Regulations. It was then handed over to the Department of Lands, so that at present the Division is without even a piece of ground on which to plant a tree and without stocks on which to insert buds or grafts that may arrive at any time from overseas. The last introductions were planted in paraffin tins at the Entomological Station by courtesy of Mr. Lounsbury, Chief of that Division.

The Staff of this Division is as under:—

1 Itinerant Horticulturist, Eastern Province—Le Sueur.
1 Officer in Charge, Warmbaths, who is leaving the Department but is now acting as temporary Itinerant Horticulturist, stationed in Pretoria—E. Walters.
1 Clerk and Acting Fruit Inspector combined, Cape Town—Edmonds.

This staff is altogether inadequate to serve the Union in horticultural matters.

Horticulture in this country is not one of the branches of agriculture that requires a propaganda of advancement to be preached; if anything, it is developing too rapidly. What is wanted is guidance, instruction and control. This it certainly does not get. There are tens of thousands of trees being planted on unsuitable sites that will never come to anything, and tens of thousands of others that are, if not absolutely lost, turned into a debit instead of a profitable asset through want of knowledge on the part of those dealing with them. The layman has only to go through the country to notice it on every side. This undesirable feature is emphasised by the boosting of citrus and apple propositions which lead the uninformed and easily influenced to imagine that there is more profit in fruit growing than there really is and that it is a simpler matter to make money out of it than is actually the case. In this connection I might say that the late Chief, Mr. Davis, in his 1916-'17 report makes the following statement:—

> "I think that my staff should be augmented by at least two more . . . . I have previously suggested such appointments. It is now my duty to urge that they be made. I do so in the best interests of the fruit industry in the Union. The total cost to the country of two such officers would not be over £1,200 per annum and the expenditure would be more than justified."

Since then horticulture has made a big jump and it may truly be said at the present time that some hundreds of thousands of trees have been planted since Mr Davis wrote the above paragraph: the limiting factor in tree planting at the present moment is the inability of nurserymen to supply, some of them having sold lines of trees three years ahead. Under these circumstances I would suggest not two men but that three or four good men be obtained and that this year a sum of £2,500 extra be placed on the estimates for this purpose, so that the Division can do the work that is expected of it in a creditable and efficient manner.

The following are the present requirements:—

1 First class citrus man for the Union.
1 Man, thoroughly versed in tropical horticulture for Natal and Transvaal.
1 Deciduous fruit man for the Western Province.
1 Deciduous fruit man (strong in apples) for the Highveld, Transvaal and O.F.S.

I suggest that they be obtained at the very earliest possible so that they can keep matters in hand as the industry advances.

With respect to the scholarships for agricultural study abroad three students at least should be selected for horticulture.

Work of the Division.—Warmbaths Experimental Station: As the citrus trees at this Station have been destroyed and the farm handed to the Lands Department, nothing need be said on the score of the work done there except that the property was kept in order up to the end and that no citrus canker was to be found on the trees at the time of their uprooting. In the event of the property being disposed of, I would suggest that a clause be inserted in the Deed of Contract to the effect that the trees and vines still on the place be preserved for a certain period and cultivated and maintained in a thriving and healthy condition by the purchaser, lessee or occupier. This will be advisable so as not to lose to the Union the various strains of olives, walnuts, vines, almonds and other trees that are on the property and which have not been distributed amongst fruit growers sufficiently to assure their establishment over suitable areas outside the Government Station at Warmbaths. Also that any authorised officer of the Agricultural Department under instruction from the Secretary for Agriculture or from the Chief, Division of Horticulture, be allowed at any time access to the property for the purpose of taking suckers, cuttings, layers, truncheons, fruit for seeds, bud wood, graftings, etc., from the trees, without charge from or remuneration to the occupiers or owners of the property.

Agricultural Colleges.—Some work has been carried out at these Institutions in the nature of experiments with stocks, seeds, cuttings, graftings and budding of various kinds of trees, also experiments with various sprays for combatting insect pests and fungoid diseases. Detailed accounts of the experiments will be coming to hand from the Horticulturists at the Institutions. The annual reports from the Schools are not yet available, but from what I can gather from the monthly reports, what with the "Flu", the want of water and other disabilities, the outlook, to say the least, is somewhat unpromising, especially in the matter of cuttings, seeds and graftings. The list of results from the Elsenburg Nursery will be found in the attached schedule.

It is greatly to be regretted that such a number of seeds, cuttings and rooted plants in the nursery perished. Most of these were growing and looking well in September, but owing to the incapacitation of officers by Influenza in October and shortage of water, attention could not be given to these at a critical time.

Inspection and Standardization of Dried Fruits.—In view of the importance of our dried fruit industry it is time we fell in line with other countries in this respect. So far no standards have been adopted by the Union for dried fruits and inspection cannot very well be carried out until standards have been arranged. I shall later on submit standards of the different dried fruits for consideration at the meetings of the different Societies interested in fruits.

Departmental Experiments and Nursery Work.—Strange though it may seem it is nevertheless true that continuous experiments attempted by this Division in propagation and nursery work at the Government Agricultural Schools and Experiment Stations, have never been a great success. Spray testing, manuring, pruning, testing for self sterility or fertility and various other experiments have been consistently and systematically carried on, and have provided some data of value to the fruit industry, but when it comes to propagation, seed testing and nursery work there seems to have been some hiatus, some adverse circumstance, something unforeseen and unavoidable or some lack of attention that has rendered efforts in this direction almost fruitless or at any rate not of the value that they should have been to the country. There must be some reason for this and I should say that it rests more in the system adopted than in anything else. I admit the Horticulturist in charge has, in the past, been responsible to a certain extent for the failure or success of these experiments but it must be taken into consideration that his responsibilities are so great and so varied, there is so much demand on his time and attention and always it is the nursery experiments that go by the board. His time is taken up in lecturing, advisory visits to farms, pruning, fruit picking, packing, marketing, drying, etc., etc. His attention is constantly directed to things of the moment, things that loom larger in his eyes, things that demand his attention and have to be done at the right time and that are really fraught with less difficulty, that are more noticeable, if neglected, than is the nursery work in the eyes of his Chief, although they may not be of any greater value to the horticultural community at large. The nursery, as the word implies, requires constant attention: the seeds, growing plants, etc., require nursing and nursing all the time and that is where the difficulty is found at the Institutions mentioned. Another drawback to the system in existence is the want of continuity of interest that would exist if one officer were permanently in charge. So many changes take place that the Horticulturist at one place to-day is Horticulturist somewhere else to-morrow, by way of speaking. The set of experiments an initiator had in hand at the one place does not appeal to or interest his successor as it appealed to or interested him, hence a little laxity (not culpable) or want of interest, a lack of battling for his interests or rights as against other interests; that interfere in the matter of his bringing to a successful issue the nursery tests or experiments already started.

I have always maintained, and am still of the opinion, that unless experiments and tests in nursery work are placed in the sole charge of one individual with plenary powers to get what he wants in the matter of labour, materials, etc., and at the time that he wants it and to have his mind forever and always soaked with experimental work, nothing much of value will be accomplished.

The Horticulturist at each of the Institutions should work in conjunction with the Experimentalist who would be directly responsible for the necessary attention to whatever set of experiments were being carried out at all, or any of the Agricultural Schools. If something of this sort is not done I am afraid experiments by the Division of Horticulture at the Schools will not receive the attention their importance warrants.

An alternative scheme would be to put the experiments into the hands of interested and capable nurserymen who would, under the general directions of the Chief of the Division of Horticulture, carry out the work. They would of course have to be adequately remunerated for their work and attention to the experiments. One such nurseryman should be selected in each area, say for the Western Province of the Cape, the Eastern Province of the Cape, Natal, the Highveld of the Transvaal, the Lowveld of the Transvaal and the Orange Free State.

It is important that something should be done in each of these districts as with our varying climatic and soil conditions one central experimental station would be almost useless.

I. TRIBOLET,

Acting Chief, Division of Horticulture.

ANNEXURE I.—RESULTS OF NURSERY AND BUDDING EXPERIMENTS AT ELSENBURG 1918-19.

Planted Seeds.	Result.
Walnuts—	
50 Juglans Rupestris	60% alive.
50 ,, Paradox	10% ,,
50 ,, Californica	18% ,,
30 ,, Regia	50% ,,
50 ,, Nigra	14% ,,
Olives—	
20 Manzanillo Truncheons	50% alive: all commenced growth.
20 Sevillano Truncheons	50% ,, ,,
60 Mixed Olive cuttings	All dead.
180 Long cuttings	All grew 3-4 ins.: now dead.
20 Cuttings—bark removed from base	All grew: now dead.
40 Medium cuttings	30% grew: now dead.
160 Short cuttings	25% ,, ,,
120 Long cuttings	50% ,, ,,
270 Nevadillo Blanco cuttings	50% ,, ,,
60 Manzanillo cuttings	50% grew: 10% still alive.
120 Sevillano cuttings	50% grew: now dead.
30 Mission cuttings	50% ,, ,,
30 Oblizia cuttings	50% ,, ,,
300 Rooted Wild Olives	30% growing.
40 Rooted Overrucosa	50% ,,
80 Cuttings	Started growing: now dead.
70 Sevillano on Domestic Root Stocks	20% started: now dead.
100 Sevillano on Wild Rooted Stocks	20% grew: 3% still alive.
100 Domestic cuttings with seed in cleft	10% ,, ,,
500 Olive cuttings of 6 different varieties	95% grew in September and October: now all dead.
400 Redding seedling Olives transplanted	90% growing.
200 O. Verrucosa budded on varieties of Domestic Olive.	5% growing.
400 Rooted O. Verrucosa	10% growing.

Kind.	Stock.	Budded.	Result.
Prunes and Apricots	Soft Shell Almond ..	10 Prunes	60% growing though poorly
	200 Small Bitter Almonds	10 Prunes and the following: Apricots—Flickering's Best, Alpha Early New Castle, Early Cape, Old Cape, Royal, Blenheim, Tilton.	60% growing but not doing well.
	200 Large Bitter Almond Stock.	10 Prunes and the abovementioned Apricots.	As above.
Peaches	200 Clingstone Peaches	Neethling's Red (Prince Albert), Free Stone Pavie, Decousa, Nectarine, Grosse Mignion and half-a-dozen other varieties.	80% growing well throughout.
	200 Clingstone Peach..	Prune d'Agen	80% good growthy trees.
	200 Free Stone Peach..	,, ,, ...	,, ,, ,,
	50 Free Stone Peach ..	10 California Almond	All growing fairly well.
		10 Paper Shell Almond	,, ,, ,, ,,
		10 Jordan	,, ,, ,, ,,
		10 Nonpareil	,, ,, ,, ,,
		10 I.X.L.	,, ,, ,, ,,
Plums..	Muir Peach	Belgian Purple, River's Late Prolific, Early Golden Drop, Kirk's, River's Early Prolific, Tragedy, Greengage, Czar, Damasc, Diamond, Hahn's d'Almagne, Pride of England.	80% growing: condition good.
	200 Muir	Japanese Plums, Clyman October, Purple Satsuma, Methely, Burbank, Wickson, Chalcot, Abundance, Kelsey, Apple, Shiro, Saomo, Sultan.	80% growing : condition good.
	200 Muir	Prune d'Agen	,, ,, ,,
	200 Vark	Elberta	,, ,, ,,
	200 Vark	Muir	,, ,, ,,
	400 Vark	Prune d'Agen	60% growing: condition fairly good.
	40 Seedling Apples ..		Medium growth.
	25 Murray Apples ..		4% growing.
	25 Northern Spy ..	Murray Apple	4% growing.
	25 van der Merwe on own roots.		4% growing.
	25 Plots Apples on own roots.		20% growiug.

Pears—

Stock.	Varieties Budded.	Result.
400 Keiffer Seedling ..	Fertility, Duchess d'Angouleme Gloumorceau, Wortemburg, Beurre Superfine, Idaho, White Doyenne, Winter Nelis, Easter Beurre, Clapp's Favourite, Kalabas, Louise Bonne, Beurre Bosc, Pitmatson's Duchess, Williams Bon Chretien, Jargonelle Laurence, Beurre Diel, Beurre Hardy, Conference, Bergamotte, Forelle.	About 35% of all varieties grew.

Miscellaneous—

35 Calimyrna Fig Tree Seedlings	90% growing.
20 Custard Apples from seed	All started: now dead.
30 Japanese Guavas from seed	30% growing.
10 Avocado Pears	All started: now dead.
40 Guavas—special seedling	20% growing.

ANNEXURE II.—DRIED FRUIT PRODUCED DURING YEARS 1910-11 AND 1917-18.

Province.	Apples.	Apricots.	Figs.	Peaches.	Pears.	Prunes.
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
Cape of Good Hope ..	180,500	280,800	113,600	1,345,400	341,600	882,500
Natal	18,000	4,800	800	38,500	2,600	1,100
Transvaal	18,500	30,400	6,700	613,500	12,900	900
Orange Free State ..	50,800	50,700	3,800	738,600	12,900	2,700
Totals	267,800	366,700	124,900	2,736,000	370,000	887,200
Census of 1911	115,964	635,370	54,064	2,575,049	178,306	641,350

Grand Totals for 1917-18 4,752,600
„ „ 1910-11 4,200,103

All varieties of dried fruits .. 552,497 lbs. more in 1917-18 than in 1910-11.
Raisins .. .. 3,847,632 „ „ „ „ „ „ „
Currants .. .. 102,694 „ „ „ „ „ „ „

Grand Total .. 4,502,823 „ „ „ 1917-18 „ „ 1910-11

RAISINS AND CURRANTS PRODUCED DURING YEARS 1910-11 AND 1917-18.

Province.	Raisins				Currants.
	Stalk.	Loose.	Sultana.	Total.	
	lbs.	lbs.	lbs.	lbs.	lbs.
Cape of Good Hope ..	480,858	4,712,025	1,138,198	6,341,081	113,778
Natal	—	—	—	2	—
Transvaal	11,498	303	60	11,761	25
Orange Free State	4,929	3,198	330	8,457	50
Total	496,287	4,715,526	1,148,588	6,361,301	113,853
Census of 1911	125,310	2,230,787	157,572	2,513,669	11,159
	3,847,632 lbs. more raisins produced in 1918 than in 1911.				102,694 lbs. more currants produced in 1918 than in 1911.

ANNEXURE III.—IMPORTS AND EXPORTS OF FRUIT AND FRUIT PRODUCTS 1913-1917-1918.

Imports.	1913.		1917.		1918.	
	lbs.	£	lbs.	£	lbs	£
Fresh Fruit	—	28,633	—	3,356	—	801
Almonds	229,551	14,416	74,712	4,109	315,709	17,735
Cocoa Nuts	—	2,595	627,423	3,157	677,566	3,475
Walnuts	27,544	661	4,708	209	99,203	3,979
Ground Nuts	2,830,453	19,119	3,088,073	17,895	3,507,547	23,752
Other Nuts	354,483	9,875	211,054	5,667	507,022	15,554
Currants	1,639,637	23,926	999,559	32,378	179,819	5,981
Raisins					22,251	815
Dates..	3,110,638	23,772	744,685	8,630	1,176,212	17,704
Figs (Dried)	204,632	3,948	5,394	109	45,002	2,579
Prunes	428,725	7,739	4,792	153	56	3
Other Dried Fruits	781,311	17,190	47,728	1,694	103,703	3,639
Bottled and Tinned	1,085,207	20,629	88,492	2,966	65,531	2,913
Pulp	116,935	1,915	20,196	389	—	—
Fruit Juices and Cordials	—	17,756	—	13,876	—	4,935
Green Ginger	—	1	3,429	15	4,480	150
		£192,175		£94,603		£104,015

Exports.	1913.		1917.		1918.	
	lbs.	£	lbs.	£	lbs.	£
Fruit :						
Bottled & Tinned ..	8,388	181	248,189	5,827	352,177	10,648
Currants	3,518	90	1,975,441	30,753	1,282	100
Raisins					3,214,961	65,749
Prunes..	761	28	60,195	1,441	16,912	847
Other Dried Fruit ..	7,306	246	134,527	4,562	468,145	14,497
Almonds	—	—	3,439	228	1,551	167
Nuts (Ground) ..	7,919	92	5,324	111	56,347	916
Other Nuts	1,742	50	7,424	509	9,808	780
Citrus :						
Lemons	—	—	211 Boxes	183	283 Boxes	248
Naartjes	—	2,217	4,759 ,,	871	1,513 ,,	555
Oranges	—	11,530	3,842 ,,	2,709	2,271 ,,	1,971
Other Citrus	—	—	—	—	9 ,,	3
Fresh Deciduous :						
Apples	—	1,239	3,397 ,,	1,915	10,864 ,,	4,688
Apricots	—	535	1,293 ,,	214	348 ,,	158
Guavas	—	—	—	—	—	—
Nectarines	—	435	6,691 ,,	838	191	33
Peaches	—	4,090	18,416 ,,	2,630	4,782 ,,	775
Pears	—	9,674	40,853 ,,	5,757	14,390 ,,	2,535
Plums	—	5,961	21,689 ,,	2,377	3,922 ,,	686
Other Deciduous ..	—	1,457	241 ,,	50	316 ,,	152
Grapes	—	12,270	23,736 ,,	2,848	6,883 ,,	1,982
Fresh Other Kinds :						
Bananas	—	763	253 ,,	499	294 ,,	511
Mangoes	—	—	144 ,,	21	3 ,,	2
Melons..	—	—	3,014 ,,	596	1,856	512
Pines	—	1,687	288 ,,	295	257 ,,	247
Other Non-Deciduous	—	—	175 ,,	87	37 ,,	19
Grape Juice	—	—	924 Gall.	200	3,000 Gall.	250
Other Fruit Juices and Cordials	—	59	—	788	2,995 ,,	1,964
Ginger, Green ..	13,160 lbs.	103	100 lbs.	4	905 lbs.	11
		£52,707		£66,313		£111,006

APPENDIX VIII.

REPORT OF GOVERNMENT VITICULTURIST.

During the year under review the work was carried out satisfactorily, although, as stated in my last report, under great difficulties as I am still acting in a dual capacity as lecturer at Elsenburg, and Acting Viticulturist.

The scope of the work has also greatly extended in that the Government Wine Farm at Constantia was placed under the supervision of this Division, to which much attention had to be given, and, further, the wines bought by the Military authorities and Hospitals, are also dealt with here. The samples were tested and analysed, and recommendations made as to quality, etc.

Oenological Institute, Elsenburg.—The amount of work in this Institute has increased considerably during the year. The wines of Elsenburg, the Paarl Viticultural Station, and Groot Constantia are all analysed here, and as at the latter two places wine is sold in bottle, the manipulation of these wines is carried out on a small scale in respect to fining and blending, so that instructions may be given to the Managers how to act. The analysing and manipulating of the wines of the three farms is in itself quite a business. Lately the selection of wines and brandies for the Military authorities and Hospitals has increased the activities of the Division still more.

Analytical Work.—As the farmers usually sell their wines in bulk to the merchants, who select the good wines and distil the rest, only a small number of samples were submitted for analysis. We had a number of wine vinegar samples, which were mostly up to the required strength. We had an interesting sample of a certain liquid extracted from *Periorium Serratum*, commonly known as *Palmiet*. This liquid was distilled and found to produce quite a fair sample of Brandy.

A sample of vinegar made from the Prickly Pear was also submitted, but the analyses showed it to be below the legal standard.

Cape Wine Levures.—Pure levures were selected and isolated. These were used in fermenting experiments in order to test their capacity for producing Alcohol. The best were cultivated on a large scale, and issued to farmers free of charge. A certain amount was also used by Wine Merchants. In all seventy bottles were issued. Some farmers, who previously had trouble with incomplete fermentations, used the levures for the first time and wrote back appreciatively of the results obtained. A certain wine merchant also who used it for the first time was very much impressed by the result.

An experiment was carried out by adding Tannic Acid to must at different stages of fermentation in order to find out whether it had any appreciable influence on the temperature, volatile acid, and quality of the wine. For this purpose 100 gallons of must, which were separated from the husk at once, were put into three leaguer casks. To each 4 oz. of Potassium Meta bisulphide were added, and 24 hours later were inoculated with 2 gallons of pure levures.

No. 1, was then left as a check; to No. 2, 1 oz. of tannin was added before fermentation started; and to No. 3, 1 oz. of tannin was added three days after fermentation had begun.

There was not much difference in temperature. The higest temperature in No. 1, was 92·5, in No. 2, 91, and in No. 3, 90 Fahr. The analyses showed hardly any difference in volatile acid, alcoholic strength, and total acid. Nos. 1 and 2 finished fermentation first, whilst No. 3, fermented very slowly for about a week longer. The quality of the wines was very similar indeed, all clearing well, and with taste good. If anything, No. 3 was the best, then No. 2 and lastly No. 1. The margin of difference, however, was very small. It is therefore clear that in most cases it will be more economical to wait and see whether the adding of tannin is necessary until fermentation is completely finished.

Short Course in Winemaking.—The fourth course was held in January, and was attended by 24 men, mostly farmers, except 3 men representing wine firms, and one school master. That these courses are appreciated is proved by the fact that eight men who attended the course in previous years, were again present. Others intimated that they are sure to attend again next year. I had hoped that a bigger number would attend, but on account of the epidemic, which threw all farm work back, farmers had to do their utmost to make up for lost time, and secondly the course was very badly advertised. These two facts certainly contributed to the smallness of the number present. The fact too that any quality of wine was then fetching a high price, was no inducement to try to get more knowledge in the matter of winemaking.

Professor Dr. Perold, of the Stellenbosch University, kindly agreed to assist with this course. Mr. Fevrier, B.A., my assistant, who is chiefly responsible for the analytical and oenological work in this Division, was kept very busy, especially as he has to attend to the students too while at practical work, and many experiments could not be undertaken on account of lack of time. It is quite evident that on account of the increasing amount of work which this branch is passing through the Institute, it will be necessary to appoint an officer who can devote all his time to this branch, in the near future.

Staff.—Mr. van Renen was appointed Manager of the Wine Farm, Groot Constantia, on a year's probation.

The clerk, Mr. Sellschop, of this Division, at Elsenburg, was transferred to Pretoria, and his place was taken by Mr. Kohler, a former clerk at Constantia who had returned from East Africa where he went as clerk to the Rinderpest Commission.

To work this Division more economically, the clerical work of Constantia was transferred to Elsenburg, thus releasing the clerk at Constantia, Mr. van den Ertwegh, who was transferred to Pretoria.

The correspondence during the period under review amounted to 1,339 letters received, and 1,619 letters despatched.

Outside Work.—As stated above the Government Wine Farm at Constantia took up much of my time, as well as the Paarl Viticultural Station.

Fifty-two farms were visited during the period under review, to give advice regarding viticultural matters. I further went to the Cape Town Agricultural Office every third, and lately every fourth Saturday, and was consulted by twenty-two persons interested in viticultural matters. I gave a lecture at Drew on the grafting of vines, fifteen farmers being present.

Shows.—I attended the Rosebank Agricultural Show, and the Western Province Wine Show. At Rosebank Wines and Grapes were exhibited from the Viticultural Division. Wines and Grapes were also exhibited at Robertson and Caledon, together with the Elsenburg exhibit. I was invited to act as Judge at Caledon but, owing to pressure of work, I had to decline as the vintage was in full swing.

Experimental Plantation of American Stocks.—These experimental plantations which are kept in co-operation with farmers in different districts, are giving valuable results. It is intended to extend the scheme but on different lines than hitherto practised. For this purpose ten of the best varieties of American stocks have been selected, viz.:—Aramon Rupestris Nos. 1 and 2, Mouvidre Rupestris 1202, Riparia x Rupestris 3306, 101-14, Jacquez. du Lot, Riparia Gloire du Montpellier, 420 A Chasselas x Rupestris 333 E.M. On these, five of our most common European varieties were grafted, viz.:—Sultana, White French. Hanepoot. Muscadel, and Hermitage. These were planted in the Elsenburg Nursery, and the finished grafted vine will be planted out on the farms. It is hoped that by this system quicker and better results will be arrived at. Many farmers have offered ground for these experiments, in fact more than I can undertake. Two new plantations were started last year, after being requested to assist. One in the Montagu district, and the other at Drew, in the Swellendam district.

Grafting Experiments.—With a view to getting a bigger percentage of strikes with bench-grafted vines several ways of statifying grafted vines in order to form callus were tried. For this purpose fresh stable manure was used for making hot beds as it is well known that the best temperature for forming callus is between 70 and 80 degrees F., and the temperature of the soil during July, August, when most grafting is done, hardly ever reaches that. Therefore the following method was tried. On the 10th July, a trench 30 in. deep, and 18 in. wide, was dug on a dry hillside. First a layer of 12 in. of stable manure was put in, and on top of this bundles of 50 grafted vines were placed, after having been well wetted. The trench was filled with grafted vines up to 6 in. from the top, was then covered with old bags, and on top another 3 in. of stable manure was placed, and finally covered with 3 in. of soil.

A stake was placed in the centre of the trench, and on removal a thermometer could easily be inserted to record the temperature in the trench. On the day after stratification the temperature was found to be 82 degrees F., and for the next ten days remained between 82 and 86 degrees F., when it gradually dropped to 62 degrees F. This was due to the fact that it rained for 5 days, accompanied by cold weather.

On the vines being removed about the middle of August, it was found that the callusing was quite good. Another interesting point was that some of the vine-stratifies were not tied with raffia, and, if anything, these callused best. The above proves that it is possible to make a callusing bed very economically. It is intended to repeat this experiment, and it is hoped with the knowledge now at hand, to be able to regulate the temperatures as required.

The French method of stratifying vines was copied as nearly as possible, viz.:—by packing grafted vines in a mixture of charcoal and sawdust, in a paraffin box. The box was laid on its side, a layer of the mixture having been first put in, a layer of grafted vines was then put into it so that the top of the scion was about level with the top of the box; next came a thin layer of the mixture. This was repeated until the box was full, taking care that it was firmly packed when finished. The vines were then well wetted with a watering can. Three boxes were packed in this way, but in order to get the required temperature (*i.e.* between 70 and 80 degrees F.), they were placed in different surroundings. One box was placed in a hole dug in the ground 30 in. deep at the bottom of which a layer of 6 in. of stable manure was put, as well as on all sides. It was then covered with a bag, and about three inches of earth. In this box the temperature varied from 62 to 84 degrees F. When the vines were planted out about a month later, the callus which had been formed was very good.

Another box was placed in a shed and here also it was placed in a heap of stable manure which covered the box entirely. In this case the callus produced was not very good. This seems to have been due to lack of moisture.

A third box was placed in a corner of a stable where four mules were stabled during the night. This box was also covered with stable manure. Occasionally the manure on top was removed, and water sprinkled over the box in order to keep the vines moist. When this was removed to the nursery about a month later the vines were found to have callused remarkably well. In all cases where the vines were stratified in the way usually practised, *i.e.*, either in the sand or in the trenches, hardly any callus was formed. The above experiments are by no means completed, but are recorded here as the information may be interesting to nurserymen who feel inclined to experiment on similar lines. From the above results it may be seen that the stratifying of vines in a mixture of sawdust and charcoal packed in boxes may be a means of considerably increasing the number of strikes of grafted vines.

Further, the tying of vines with raffia may be entirely discarded, which is the custom in Europe. Incidentally it may be mentioned that Muscadel grafted on Aramon was stratified untied in this way, and from counting in the nursery promises to give 70 per cent. strikes. Considering that this is the first trial, and that Muscadel grafted on Aramon is known to give a very low percentage of strikes, this must be considered very promising indeed.

VITICULTURAL EXPERIMENT STATION, PAARL.

Ampelographic Collection.—To this collection which already consists of 200 varieties, some new ones have been added, viz.:—Gardo Blanco, Henab, and Zante Currant, and one American variety. These were imported from France and Australia.

Many people are visiting this Station to study the grapes, methods of pruning, trellising, etc. As a result of a Robertson farmer seeing our Port varieties in bearing, he gave an order for practically all the scions we could spare of these varieties.

An experiment was made for trying the suitability of Rosaki and Waltham Cross as varieties suitable for raisin making. Samples of the raisins were sent to different merchants who were invited to express an opinion. The concensus of opinion was that the Rosaki made an excellent raisin, and if it could be produced on a large scale it would find a ready market. Considering that this grape is an excellent table grape, and good shipper, and further that it ripens about a fortnight earlier than Hanepoot, this grape seems to have a great future and, in time, may replace the Hanepoot to a large extent.

Sale of Table Grapes.—As there were no facilities for export, most of the grapes were issued to the Military Hospitals in the Cape Peninsula, except a small quantity which was sold on the Johannesburg market, because the Hospitals could not take all. In all 150 boxes of 8 lbs. each were sent to the market, and the money received amounted to £30 7s. 9d. nett. This works out at £50 odd a ton. If we consider that it is possible to get 10 ton of grapes from a morgen of ground, it is quite clear that the growing of high class table grapes is a paying proposition, and worth while to be taken into consideration by the small holder who may happen to have soil suitable for vines. We may state that our agent at Johannesburg wrote after each consignment that, for good quality grapes, as supplied by us, he could find a ready market.

When shipping accommodation is again available no doubt even better results will be obtained.

Sale of Vine Cuttings.—We sold 18,100 cuttings of wine grapes, consisting of 38 varieties; 5,437 cuttings of table grapes, consisting of 57 varieties; and 17,165 cuttings of American stocks, consisting of 21 varieties. Hereby the more satisfactory varieties are distributed all over the Union.

Wine-making Experiments.—An experiment was carried out in the making of a Sherry with four different varieties of grapes, viz.:—Pedro Jeminiz (Cape Pedro), Palomino and Castelliano, to determine which wine produced from these varieties will give the best Sherry. Thus far the Cape Pedro (Woolly leaf) seems to mature quickest, although the Palomino runs it very close.

Shows.—On account of the Manager having had a serious attack of the influenza, I decided that no wines or grapes should be exhibited at the Paarl Show as usual, as the vintage was near at hand and a breakdown in his health would have seriously disorganised the work. Slight attacks during the vintage convinced me that this was a wise step. However, small lots were forwarded to the Robertson and Caledon Shows, and, as already stated, grapes, wines, and brandies were exhibited at the Rosebank Show, as part of the Viticultural exhibit.

The revenue of this Station was as follows, viz.:—

	£	s.	d.	£	s.	d.
Sale of Wine	211	6	2			
Sale of Cuttings	17	17	9			
Sale of Grapes	32	14	11			
Miscellaneous Sales	3	7	0			
				265	5	10
Free Issues to other Departments	14	0	0			
Fruit Issued to Hospitals	26	13	4			
				40	13	4
Total				£305	19	2

The Expenditure (exclusive of Manager's Salary) was £214 3 3.

Government Wine Farm, Groot Constantia.

This farm was placed under the supervision of the Viticultural Division from April, 1918. This change was certainly in the right direction, as it was always felt that to work this Division smoothly, the different Viticultural Government Farms had to be under one head, so that one policy could be carried out to avoid duplication of experiments, etc. It is sure to prove more economical in several ways in the end, as one expert can be employed instead of two, and the clerical work is all done in one office, thus doing away with one clerk.

The Vineyards.—When this farm was taken over it was found that things were bad all round. The vines are grafted mostly on the wrong stock, for which nobody can be blamed, for, at the time the vines were planted, the *Metallica* was considered an excellent stock. It is now well-known, that, except in exceptional instances, vines grafted on this stock deteriorate after 10-12 years, unless well nursed with manure. This fact seems to have been overlooked.

I, therefore, had six acres of vines uprooted as they were in a non-paying condition, and there was no hope of ever getting them right again. The rest of the vines were well manured, and pruned in such a way as to produce healthy wood, and not fruit. The result is a marked improvement in the wood growth, although some parts will have to be uprooted in the near future.

The Orchard.—This is in not too good a condition either, and here too parts will have to be uprooted. It was well sprayed and cared for. Unfortunately, owing to a bad season for peaches, this crop was a total failure. The pear crop on the other hand was quite fair.

The fences on the farm were in such a state that they were of no use, much time and labour had to be spent in renewing old fences, and erecting new ones, repairing old gates, and erecting new ones, and yet the task is far from complete.

Much time was also spent in reclaiming ground, which had been allowed to be overgrown with bush and sapling trees.

A vegetable garden was started for the sake of the apprentices on the farm. Some oats were sown, and kale grown for forage and feed for horses and cows.

The draught animals were in a very poor condition, and according to the Veterinary Surgeon, mostly over 20 years of age. It was, therefore, necessary to destroy four of them, and two were sent to Elsenburg in exchange for others more fit to do heavy work.

Consequently six more animals had to be procured.

Apprentices.—This farm is now used as a training ground for young lads between the ages of 15-18 years. This is to meet the needs of lads whose parents are not in a position to send their boys to one of the Agricultural Schools. Here they are given free board and lodging, working clothes, medical attendance, and £1 8s. monthly, of which £1 is put into the Savings Bank to the account of the boy, and 2s. given him weekly for pocket money.

The training consists of instruction in Viticulture, Wine-making, Horticulture and Vegetable gardening; Nursery work and Tobacco culture will be added next year. A certain number of lectures are given too, but the major part of the instruction is learned by actually doing the practical work, when either the Manager, or his Assistant, give the necessary instruction.

It is quite evident that to do all the farm work with such young inexperienced lads is practically impossible. They can hardly cope with keeping all the established vineyards, orchards, etc., in order, without doing any developing work. It has, therefore, been found necessary to employ a span of convicts from time to time to assist, for instance, during the vintage, and for doing some development work. In trying to work the farm with these apprentices it is quite plain that the expenses must be rather high, especially if we consider that owing to their inexperience, the breakages of implements, etc., and the damaging of vines and trees when pruned, gives an indirect loss not easily calculated.

These mishaps will occur no matter how much the Manager, or his Assistant, may supervise their work, as it is impossible to watch every apprentice all the time. On the whole, though, it must be stated that the boys are well behaved, and some are really in earnest, and anxious to learn as much as they possibly can while there, and are giving every satisfaction.

If we look upon this training of boys as a State charity scheme, and the good results it has already brought forth, it easily counterbalances the complaint often brought forward that this Institution is not a paying concern. The value of such an Institution is indirect, and not direct. In time, however, it is hoped that it will prove to be a direct financial success.

During the period under review 6 apprentices left the place, obtaining positions as foremen at salaries between £5 and £10 per mensem, in the following districts: Worcester, Ceres, Stellenbosch, Darling and Tarkastad.

The number taken on is 10. The health of the apprentices was good during the year, except during the Spanish Influenza when all were affected, but, fortunately, there were no serious cases.

During the year the apprentices have moved into new quarters, and are now comfortably housed.

General.—As stated above, things were in a bad state when the farm was taken over. There seemed to be no system of organising and developing the farm, and, consequently, much time had to be spent in re-establishing things, which should never have been allowed to drift into such an uncared for state. It was found that there was an unnecessarily large stock of wines on hand, consequently over 200 leaguers of wine were disposed of. The carting of this, as well as the carting of building material for the P.W.D., who were busy on the farm for a long time, fixing up new quarters for the apprentices, and repairing the Hostel, Manor House and outside buildings, handicapped the farm work to a certain extent. It was managed, however, to keep the plantations in good order. But the idea of breaking up any new land had to be abandoned. On the whole, the work done on the farm must be considered quite satisfactory.

The farm in general, as well as the plantations, etc., show improvements everywhere. It is felt, however, that much is to be accomplished yet, and to do this the Department will have to spend money liberally for the next couple of years. It is quite safe, however, to state that such money will be well invested and in the near future the desired results will be reaped. It is proposed for instance to plant the 100 acres of good fertile mountain soil belonging to this estate with forest trees. This will require a big outlay, which may yet in time repay all the capital ever invested in it.

GOVERNMENT FARM, CONSTANTIA.

The revenue of this Estate was as follows, viz.:—

	£	s.	d.
Sales of Wine	3,142	5	10
Sales of Stukvats	817	19	10
Sales of Timber	76	12	0
Sales of Vines	60	17	3
Sales of Fruit	33	18	5
Sales of Carbon Bisulphide	11	0	9
Sales of Cow and Calf	9	2	6
Sale of Wine Lees	9	1	6
Sale of Cape Cart	4	0	0
Sales of Milk	2	1	2
Refund of Clothing, Apprentices	45	11	2
	£4,212	10	5
Gratis Issues to other Departments	10	11	6
Gratis Supply of Fruit to Hospital	469	1	10
	£4,692	3	9

The expenditure amounted to £3,075 18s., to which must be added the sum of £84 8s., representing free issues from other Departments, making in all £3,160 6s. This includes all the expenditure incurred in connection with the apprentices, which, being in the nature of a charity, should not, to my mind, be charged against the farm as general expenditure. The amounts involved are as follows, viz.:—

	£	s.	d.
Salary of Housefather and Matron	193	0	0
Wages of Assistant Matron	36	0	0
Wages of Cook, Assistant Cook and Washerwoman	66	0	0
General Maintenance of Apprentices	810	0	0
Payments made to Apprentices	250	0	0
	£1,355	0	0

General.

The total grape crop for 1918 is estimated to have produced about one hundred thousand leaguers of wine. In the Constantia area and the Stellenbosch and Paarl districts the crop was decidedly poor. From Wellington northwards it seemed to improve, but on the whole the crops were not good. If it were not that wine at vintage time was sold at high prices, and consequently less raisins were made, the quantity might have been much less than in the previous year, instead of being about the same. As the vintage of 1917 was only fair, it was expected that we should have a good crop in 1918, but the climatic conditions during August, 1918, were quite abnormal. Only about half an inch of rain fell during the month, and that not all at once but scattered, thus reducing the benefits to almost nothing. The average rainfall for this month is usually about 4½ inches. This drought was considered to be responsible for the poor crop. Fortunately during October, November, December and January, we had good rains at reasonable intervals. This resulted in the grapes growing out well, and giving much sap, which counterbalanced the smallness of the crop to some extent.

Owing to the shortage of wine towards the end of 1917, many thousands of leaguers of the coming 1918 vintage were sold in advance at £6, £7 and £8 per leaguer, which shortly after the vintage rose to £10 and £12 per leaguer.

This buying of wines in advance regardless of quality is much to be regretted.

Notwithstanding the fact that climatic conditions on the whole were very favourable during the vintage time, with the exception of one warm week, and that the grapes matured well, the reports show that the quality of the crops as a whole, is very poor. This is contrary to expectations, as it was considered that owing to the above-mentioned conditions, the quality would be very good.

I believe the complaint as regards quality is pretty general with the Wine Merchants. One Merchant stated that after sampling about two thousand leaguers of wine, he could hardly select two hundred leaguers of good quality wine.

Vineyards.

The demand for grafted vines is still considerable, and much larger than the supply.

Sultanas, Muscadel, Hanepoot, are still leading in the Worcester, Montagu and Robertson districts, although also largely planted in the Swellendam, Heidelberg, Cape, Oudtshoorn and neighbouring districts. Owing to indications of a rise in Ostrich feathers, the idea of planting seems to have been checked to some extent.

In the Western Province, Green Grape, Hermitage, Steen, White French, are still the most favoured varieties.

Owing to a favourable summer the vines grew well, and produced good wood.

Diseases.—Oidium and Anthracnose appeared in very many vineyards as climatic conditions were very favourable for their development. At the beginning of the season the Sulphur supply was very limited, and prices high. Farmers therefore did not use the same amount of sulphur, with the result that many vineyards were badly affected. There were also complaints as regards the quality of certain brands of sulphur.

American Stocks.—Of the different American stocks the Rupestris Aramon, Rupestris X Mourvedre, "1202", Jacquez, and Riparia Gloire de Montpellier and Du Lot are the chief varieties used as stocks.

On account of a fairly moist summer fewer complaints came to hand of vines showing deterioration. Yet it is felt by the farming community that the question of the suitability of the American stocks on different soils, and under different climatic conditions is a question which still needs further investigation. With this object in view we are extending the experimental plantations in co-operation with farmers in different districts.

It is hoped that during the coming year a Commission will be appointed to go into this question thoroughly, with a view to collecting data on the various problems regarding American stocks.

Vintage, 1919, *Constantia.*—As the 1919 vintage was considered on the whole a bad one, as regards quantity, and especially so in the Constantia area, it is not surprising that the crop on this farm was rather small too, being fifty-five leaguers as against a hundred odd in 1918. The grapes ripened well, and there were practically no bad grapes, and the resulting wines are of as good a quality as any of the previous years. In fact it is known that the Constantia red wines are rather too astringent. By careful fermentation it was tried to avoid this production of too astringent a wine, and as far as the young wine can be judged, an improvement is shown, and this is very promising.

S. W. van NIEKERK,

Acting Government Viticulturist.

APPENDIX IX.

DIVISION OF ENTOMOLOGY.

1. *General.*—The work of the Division has been along the lines followed in previous years and enumerated in the last annual report. There was no outbreak of migratory locusts during the 1918-19 season, and the burden of administrative work in connection with locusts has been lighter than in any year since 1913. Owing to the war, there was practicably no importation of plants, fruit, and potatoes and, therefore, the duties of the Division concomitant on such imports were most exceptionally light.

2. *Staff.*—The duties and headquarters of the various technical and general service members of the staff remain as defined in the previous report with modifications as follows:—D. Gunn, Entomologist, was transferred from Pretoria to Port Elizabeth at mid-year to take charge of a new branch, and his place at Pretoria was filled by the transfer of J. C. Faure from Bloemfontein. The branch at Bloemfontein was closed, it not being deemed necessary to continue it in view of the shortage of staff and the appointment of an entomologist at Glen by the Education section of the Department. G. C. Haines, Assistant Entomologist, after working five years on wattle insects in Natal, has been transferred to the Transvaal and given special work on cotton insects; at present he is stationed at Rustenburg. S. H. Skaife, Assistant Entomologist at Capetown, was released towards the end of the year to accept the lectureship in entomology at Cedara. No one has yet been proposed to fill the vacancy thus created. J. L. King, Plant Inspector for East London, resigned early in the year to accept a more lucrative post outside of the Government service. Because of the war, his ordinary duties had come to require very little of his time but he was kept busily employed as grain grader for the port. On his retirement, a special officier for grain grading was appointed, and it has been arranged that this officer carry on the plant inspection services until they reassume their normal importance. The grain grader, however, is unable to attend to local nursery inspection, a duty that should be incumbent on the plant inspector, and he cannot be expected to exercise nearly so efficient a safeguard against the introduction of pests with imported plants as would a specially trained inspector. As soon as practicable a qualified entomologist should be stationed at the port to serve as plant inspector in conjunction with insect investigations. At each of the principal ports there certainly should be an experienced entomologist with one or more assistants possessing as good qualifications as have heretofore been required in plant inspectors.

3. The Division at present is in very serious need of additional entomologists of junior rank, but no steps are being taken to get qualified men for the simple reason that no qualified men are available in the country and that the salaries and prospects are now so poor that it is almost useless to seek men oversea. There is one Pretoria and one Capetown vacancy, and there is pressing need for trained assistants at the Durban and Port Elizabeth branches. At present the Entomologists at Capetown, Durban, and Port Elizabeth are without assistants. It is urgently necessary that the Government decidedly improve the prospects and offer scholarships to induce suitable men in the country to go oversea for special education and training. It is five years since any scholarships in entomology have been awarded and, now that the war is over, steps should be taken to begin to make up for lost time in fitting men for entomological posts. I believe that one man a year on the average is needed to provide for losses and practically compulsory expansion; and I think that at least three men should be started in the present year and as many more in the following year as an offset to none being started in the past several years. To get really satisfactory candidates for the special scholarships, it is essential, I repeat, that the prospects in the positions be decidedly bettered. We want industrious bilingual men of good physique, good natural ability, pleasing presence, and sound common sense who will be practically certain to turn out well; and the better a man the less likely is he to be tempted by scholarship terms that incidentally bind him to accept a post on a short range salary scale on which he will have to remain until, in his turn, he can be elevated to another scale through the dropping out of a senior officer.

4. The newly-established "faculties of agriculture" at two of our universities hope to turn out graduates fitted to take up technical posts in our Department, and are disposed to remonstrate against a resumption of the practice to offer oversea scholarships. But in respect of entomology, I firmly urge that oversea scholarships be awarded regardless of the increasing means for students to acquire special education in the country. When the new institutions are producing a creditable output, I think it will be time enough to consider a change of plan. Graduates of the new schools would be preferred candidates for oversea scholarships, and I imagine that the natural development will be to send such graduates oversea for a year or two to supplement their class room education in this

country by some experience at one or more oversea schools for advanced study and at one or more agricultural experiment stations or investigation camps. The Bureau of Entomology of the United States Department of Agriculture is quite willing that students from oversea avail themselves of its unique facilities for one to acquire practical training rapidly and to observe the most recent methods of investigation and the latest achievements. The advantage of a year of travel and training in America to supplement university education is recognised in Great Britain. For a number of years, a "Carnegie" grant of £1,000 per annum has been available to the Imperial Bureau of Entomology for scholarship purposes in this direction, and a dozen or more British students of entomology have been aided.

5. *Publications.*—In respect to its publications for the benefit of the farming public, this Division, in common with the other divisions of the Department, continues to be handicapped by the absence of the "Agricultural Journal," the publication of which was suspended at the outbreak of the war. I believe the Union to be the only country that suspended the issue of its magazine medium for disseminating information amongst its agriculturists: and I strongly urge that the publication of a departmental periodical of some sort for miscellaneous news and timely information be resumed without loss of time. The "bulletin" channel for publication is inadequate, and in practice it has proved to lend itself to inordinate delays. Although the prompt printing of bulletins on special subjects has been pressed for time and again, their publication has commonly involved many months during which the timeliness of the information has seriously decreased. The bulletins listed hereunder were issued for the Division during the year; and the dates set against the several items reflect the delay of which I complain. The typescript for the three bulletins marked with asterisks was submitted in the two languages so in their cases little if any of the delay can be attributed to the necessity of translation. The printer's proofs of all were very promptly returned by this office with the exception of the proofs for No. 1, which were very long delayed through circumstances over which I had no control:

PUBLICATIONS.

Official No.	Title.	Author.	Pages.	Illustrations.	Submitted.	Issued.
Bull. 1, 1918	Some Insects injurious to the Black Wattle.	C. B. Hardenburg.	41	23 full page	25.9.17	10. 4.19
Bull. 9, 1918	The Bagrada Bug ..	D. Gunn ..	16	3 full page	26.6.18	10.12.18
Bull. 10,* 1918.	European Foul Brood.	C. P. Lounsbury.	20	2 full page	26.8.18	10. 2.19
Bull, 11, 1918.	The White-lined Grape-vine Sphinx Moth.	D. Gunn ..	6	1 full page	17.9.18	10.12.18
Bull. 12, 1918.	Pea and Bean Weevils.	S. H. Skaife	32	17 figures	13.9.18	27.12.18
Local Series 57.	Report on Typhus Conditions in Native Dwellings.	C. K. Brain	20	4 full page	28.5.18	25. 3.19
Local Series 59.*	Cotton Pests of South Africa.	C. K. Brain	29	24 figures	26.8.18	8. 1.19
Local Series 61.*	Pernicious Scale ..	C. K. Brain	4	2 figures	17.7.18	27. 1.19

Two publications in science journals should be recorded here; they are:—

Title.	Author.	Journal.	Pages.	Illustrations.
The Coccidae of South Africa—II.	C. K. Brain..	Bull. Ent. Res. ix, 2, Sept., 1918.	32	5 plates.
On the Persistence of Arsenite of Soda in the Soil.	C. W. Mally..	S.A. Journ. Sci., July, 1918.	5	—

Other publications include the "Register of Nurseries" for 1918, and a number of timely articles on insect pests in various farming and gardening papers.

6. *Nursery Inspection.*—The inspection of the registered plant nurseries of the Union continues to be conducted ably by Senior Nursery Inspector A. E. Kelly, assisted by Nursery Inspector J. Hodgson. Much space was devoted in the last report to a discussion of the requirements of nurserymen, and of the general principles followed in applying restrictions on the sale of nursery stock, and it seems unnecessary to dwell on these phases

of the subject this year. However, I wish to record that I still consider that the public would get much better nursery stock if nurserymen were required to pay a heavy license fee in respect of the privilege of trading, but the time does not seem opportune to introduce fresh legislation to this end. I also think that, with limitations intimated last year, the public should be acquainted with the imposition of quarantines. At present a really suitable medium in which to notify quarantines is lacking; were the official "Agricultural Journal" to be restarted I would have the chief quarantines notified in it. In my last report I suggested that notifications in the Government "Gazette" might answer the purpose if copies were sent to the agricultural and horticultural papers; but I have since learned that the chief papers I had in my mind would not care gratuitously to publish information of the sort on the ground that it would lead nurserymen to withdraw their advertisements.

7. The total number of nurseries registered for the year September, 1918—September, 1919, is 358. The number in the Cape Province is 199; in the Transvaal, 103; in Natal, 34; and in the Orange Free State 22.

8. The nursery plants that were expected to be ready for sale during the year, according to the information given by the nurserymen in their applications for registration, were as follows:—Deciduous fruit trees, 2,124,447; citrus fruit trees, 434,059; other fruiting plants, including bush fruits, 382,880; vines (in nurseries not confining their trade to the south-western vine districts), 1,167,122; forest and shade trees, 14,911,292; hedge plants, 1,232,525; roses, 465,000; woody ornamentals, 246,642; palms, 144,350; and greenhouse stock 190,455. The figures for deciduous fruit trees are an increase of nearly 40 per cent., over those for the previous year, and are practically double those for the year 1915-1916, and for any previous year of which there is a record for comparison. The figures for citrus trees, on the other hand, are a decrease of about 35 per cent. (Note: In my 1917-1918 report the figures for citrus trees were given as 987,189, but should have been given as 690,189). Practically the whole of this decrease was brought about by the eradication of all the citrus nursery stock in the registered nurseries of the "citrus canker" area; the budded stock for which compensation was paid totalled over 160,000, and the unbudded stock about 245,000. Apart from the citrus stock in registered nurseries there is now a very large quantity in private nurseries belonging to companies who plan to plant large estates and then to dispose of the orchards in small plots.

9. The climatic conditions of the year were markedly unfavourable to Cape nurserymen, particularly in respect of deciduous fruit trees, and the epidemic of "Spanish influenza" that raged in the spring much increased the difficulties many of the nurserymen had in propagating stocks. The position in regard to apple stocks is especially bad, and it seems certain that there will consequently be a serious shortage of apple trees for planting in the next few years unless the prohibition on the importation of apple stocks is relaxed, and the nurserymen are thus enabled to buy the stocks they need. From reports made to the Division by a few leading Cape nurserymen about four-fifths of their apple stocks failed in the year.

10. The number of quarantines imposed on nurseries during the year numbered 34 in all; in 7 cases the restrictions applied to the entire stock. In addition there were 13 quarantines carried over from the previous year. The new quarantines affected the sale of 174,480 citrus trees, 5,178 deciduous fruit trees, and 83,780 other plants; but 20 of the 47 quarantines were removed before the financial year expired, and others will probably be removed in time for sales to be made during the winter selling season.

11. Red scale continues to be predominantly the cause for quarantine measures; it figured in 26 out of the 34 new quarantines, and was the sole cause in 16 cases. Three quarantines were imposed solely on account of woolly aphis, and one each on account of ross scale, circular purple scale, pernicious scale, green soft scale, and pustular oak scale. Ten quarantines were applied because of two or more pests; and in these cases circular purple scale figured 7 times, woolly aphis and Spanish red scale 3 times each, white peach scale, ross scale, and silvaticus scale 2 times each, and grey scale, pernicious scale, mussel purple scale, green soft scale, and Maskell's scale, once each. Pernicious scale was again found in all the nurseries in Pretoria. A suspicion arose during the year that the citrus thrips of California occurred in South African nurseries, and this pest was specially watched for in consequence. It was observed that slight injury to citrus nursery stock and of certain deciduous nursery stock by thrips was widespread, but in no case was the special citrus species discovered.

12. *Plant Import Regulations.*—The measures and procedure for minimizing the risks of new pests reaching South Africa with imports of plants and fruits from oversea remained unchanged during the year. Owing to the irregularity and scarcity of the shipping services, the imports were small compared even with the earlier years of the war. The risk that the plants would dry out and perish through delay deterred most persons from trying to introduce any plants, and a considerable percentage of the plants that did come arrived dead, or almost dead. The actual plant importations, according to the inspection reports of the several port officers were as shown in the subjoined table. The figures in brackets show the number of consignments and the main figures the number of plants.

Importations of Plants.

Kind.	Cape Town.	Port Elizabeth.	East London.	Durban.	Johannesburg and Pretoria.	Total.
Fruit Tree Stocks:						
Pear	114,500 (3)	—	—	—	—	114,500 (3)
Plum	12,000 (1)	—	—	—	—	12,000 (1)
Cherry	10,000 (1)	—	—	—	—	10,000 (1)
Fruit Trees	102 (4)	—	—	221 (6)	—	323 (10)
Fruit Tress (Cuttings)	—	—	—	305 (2)	—	305 (2)
Bush Fruit Plants	171 (4)	—	—	20 (1)	—	191 (5)
Strawberry Plants	—	—	—	130 (1)	100 (1)	230 (2)
Roses	103 (7)	22 (1)	53 (3)	19 (1)	161 (4)	358 (16)
Ornamental Shrubs, etc.	5 (2)	—	—	258 (3)	39 (4)	302 (9)
Palms	200 (1)	—	—	—	275 (1)	475 (2)
Carnations	455 (1)	1,000 (1)	30 (1)	507 (3)	113 (2)	2,105 (8)
Chrysanthemums	30 (1)	—	—	17 (1)	—	47 (2)
Other Soft Plants	116 (12)	—	24 (1)	226 (7)	57 (5)	423 (25)
Sugar Cane Cuttings	—	—	—	12 (1)	—	12 (1)
Manioc Cuttings	—	—	—	50 (1)	—	50 (1)

13. There was also imported one lot of 55 lbs. of Egyptian cotton seed for sowing, and two lots aggregating 209 tons of cotton seed from British East Africa for pressing. The examination of the Egyptian seed disclosed that about 40 per cent. of it had been more or less damaged by insects, and it is presumed that most of the damage was due to the very notorious pink bollworm. Some dead larvae taken to be of this pest were found, but no live insects. The importer was allowed to get only a few hundred perfectly sound seeds. Sometime later it was learned that the seed has been heated in Egypt as a precaution against its carrying live pink boll worm, but the pest named is so greatly to be feared in South Africa that the Division is not prepared to pass even heated seed for sowing. No more cotton seed for pressing is to be allowed entry. The bulk of the 209 tons admitted last year had been on shore several days before the inspector learned of it, and it was decided that the safest means for disposing of it was to get it subjected as quickly as possible to a degree of heat certain to be fatal to the vitality of all life in it. This was done by running it through the apparatus used for desiccating whale flesh at the Bluff near Durban. The importers had not known of the restrictions on the importation of seed; and the sterilization of what they brought in cost them so enormously that no commercial firm is likely to seek authority to introduce other seed under like conditions. Various living insects were found in and amongst the seeds, but none that were suspected of being the pink boll worm.

14. The inspector at Cape Town found many swellings suspected to be of bacterial nature on a lot of 21 olive trees from Australia. The other "finds" made on imported plants by him were prinicipally on the frut tree stocks. In one lot of 8,000 pear stocks from France, there were found ten cocoons of unidentified moths, one cluster of apparently living eggs taken to be of the European tussock moth (*Notolophus antiqua*), and a number of trees infested with living scale insects identified as *Pulvinaria betulae*, *Aspidiotus piri*, and *Lepidosaphes ulmi*, and 25 trees with crown gall swellings. In another lot, one of 46,500 pear stocks from France, there were detected three living beetles, 2 cocoons, 45 trees with crown gall, and 23 with living scale insects identified as *L. ulmi* and *A. piri*. Several dozen scale insects were on a single cutting from one of the trees. In the only other consignment of pear stocks, one of 60,000 plants from France, there were found 82 with crown gall, 35 with *Aspidiotus ostreiformis*, 3 with *A. piri*, 68 with *Epidiaspis betulae*, and 3 with a woolly root louse. Of the five scale insects named, not one is known to be established anywhere in South Africa, and any one of them, if established, would probably develop into a serious pest.

15. The inspector at Durban found a caterpillar borer in poplar trees, a bostrychid borer in manioc, an unrecognized wax scale and an armoured scale on magnolias from Japan, an *Asterolecanium* scale on bamboo, mealy bug and a colony of ants in a lot of orchids, a snail on a fern, woolly aphis on apple scions from the best known Australian nursery, and quite a variety of other insects with other things.

16. These brief notes on the findings of insects during the past year of exceptionally few imports of plants from abroad serve fittingly to introduce a serious suggestion that the Government should take radical steps towards establishing official "plant introduction gardens," through which, and through which only, plants from oversea should be admitted into the country. The beginning should be made with fruit bearing plants, but the aim should be to extend the principle as rapidly as possible to roses and the ornamental trees

and shrubs most closely allied to fruit and plantation trees, and to the more commonly demanded shade trees, and then gradually to all other woody plants, and on to palms and soft plants and to bulbs, and ultimately to seeds, starting with the cereals and extending first to the more important crop and plantation tree seeds. Potatoes should be taken care of at an early stage. No expense nor trouble should be permitted to stand in the way of developing a highly efficient plant inspection and quarantine service at each place complete with special vacuum and other fumigation chambers, incinerators, elaborately screened inspection rooms and detention plant houses, isolated field sites, etc. Primarily the institutions I have in mind would be to safeguard the country against the grave menace of new plant pests and diseases from other lands; but I deem it of great importance that the Union establish and maintain extensive tree and plant testing gardens wherein the public may view specimens of all the kinds and varieties of fruit and plantation trees, and the more serviceable ornamental trees and shrubs that can be grown, and I consider that the quarantine and plant specimen gardens should be in conjunction and in charge of the same band of experts. Two institutions should be ample at first, one convenient to Cape Town and the other convenient to Durban, and both chosen with the view of providing suitable conditions at one place or the other for all the kinds of economic plants that might be profitably cultivated in the Union. Incidentally the gardens should be models of landscape gardening, and otherwise made as educationally attractive as possible to visitors; but they should not be alienated from the Department of Agriculture, nor should any attempt be made to encroach on the purposes of the national botanic garden. In the fulness of time, however, the institutions should be made a source of material help for the several so-called "botanical gardens" in the country, and should be a source from which those gardens and also nurserymen could obtain scions of new varieties for propagation.

17. South Africa has been hard hit by some insect pests and diseases of plants that have come to it from oversea. Amongst such afflictions are vine oidium, vine phylloxera, red scale, pernicious scale, Australian bug, codling moth, fruit fly, peach aphis, cabbage aphis, lucerne nematode, potato blight, apple and pear fusicladium, and citrus canker; but important and numerous as are such pests, South Africa may be said to be relatively fortunate in respect of its undesirable introductions. There is a great number of extremely serious pests and diseases still to be guarded against. The United States Department of Agriculture in 1917 published a list of 130 "important foreign insects which have been introduced into the United States," and of the number only 43 are known in South Africa, and in the 43 are included the grain weevils and moths and other seed insects that are practically cosmopolitan. The American government has recently adopted extremely rigorous "quarantine" measures owing to a vivid realization that its country is still menaced. Our Union government has even better reason to increase its precautions. Amongst the grave troubles that have reached America but not South Africa are the lucerne weevil, cotton boll weevil, sweet potato weevil, pink boll worm, gypsy moth, brown tail moth, oriental peach moth, Japanese beetle, European maize stalk borer, citrus white fly, pine blister rust, and potato warty disease. Then apart from known troubles there are unknown troubles to consider, and it is quite a well known fact that many of the very worst plant plagues have remained unnamed or at least unrecognised as important until they have spread to a new country. In citrus canker South Africa has a good illustration of the menace of quite a new disease. No one knew there was such a disease a few years ago, and now there are countries striving to eradicate it almost regardless of expense, and other countries standing in such fear of it that they will not admit a citrus fruit, much less a citrus tree, from any country where the disease is known. Our Union Government has expended about £60,000 in the last two years and expects to expend about £30,000 in the present year in combating this one disease. A government that can afford to expend thus freely in an attempt to exminate a single trouble can surely well afford to establish and maintain elaborate "plant introduction stations" to strengthen its defence against the host of troubles of which it stands in danger.

18. The importation of fresh fruit practically ceased during the year owing to the transport difficulties but it will doubtless quickly pick up now that the war is over. The total importations recorded by the inspectors for the financial year aggregated only 13 cases of apples, 12 cases of citrus fruits, 20 of mangoes, 7 of bananas, 2 of litchis, and 1 of avocados. The fruit was largely in single case lots brought as presents, and it came from Europe, North and South America, Australia, Mauritius, Zanzibar, British East Africa, and St. Helena. It brought the usual assortment of infesting insects, including the mango seed weevil, but nothing not already known in the country.

19. The introduction of potatoes was also at a standstill; only 317 lbs in all are reported in the inspectors' returns. Now that shipping conditions are again becoming favourable, many merchants are enquiring about the restrictions in force and hence I expect that the importation of seed potatoes on a large scale will be resumed as soon as supplies and shipping space are available.

20. *Plant and Fruit Removal Regulations.*—These regulations continue to be applied as heretofore and there was no change in them during the year. The regulations restricting the traffic in apples, pears, and quinces as a measure for retarding the spread of

the codling moth, really should be amended or abolished altogether; but the public has lost almost all interest in them. Very few infringements were reported during the year and there were no prosecutions so far as known to the Division.

21. The remarks in last year's report about the weakness of railway and postal in-transit plant inspections apply with equal or greater force to the year under review. The number of inspections recorded in the reports of the several examining officers are as follows:—

IN TRANSIT PLANT INSPECTIONS.

	Cape Town.	Durban.	Port Elizabeth.	East London.	Johannesburg.	Pretoria.
Postal sendings	31	1	2	2	127	58
Railway sendings	22	16	30	12	187	116
Sendings fumigated ..	17	7	9	3	47	53

The Johannesburg figures are relatively high because so much traffic centres there, and because there and at Pretoria the Division is able to exercise a closer supervision than at the other centres. The Pretoria figures are high because, owing to pernicious scale, the examination is made to include tender plants that are passed without record elsewhere. All sendings of plants by nurserymen from Pretoria are specially inspected on account of the local prevalence of pernicious scale; and, in the ordinary course, the precautionary fumigation of all woody plants to leave Pretoria is required. The number of such special inspections and fumigations of nursery stock during the year were, respectively, 467 and 422.

22. Red scale was detected in the inspections more frequently than any other insect. The great majority of the plants were reported apparently clean but, apart from red scale which was often found, all the following insects were found once or more; pernicious, circular purple, mussel, soft, mango, greedy, ross, and pineapple scales; Australian bug, mealy bug, Mesembryanthemum pulvinaria, woolly aphis, rose aphis, citrus psylla and bryobia mite.

23. *Importation of Beeswax.*—Because it is feared it may bring infection of bee diseases, beeswax is admitted only under permit. The consignee must surrender a declaration that any foundation comb or yellow beeswax was heated for half an hour at 212 degrees F. or else, in the case of yellow wax, have the article heated to this extent after its arrival. Any wax that appeared to be in a crude condition would be heated, irrespective of any declaration; but there stemed no reason to challenge the truthfulness of any declaration during the past year. The imports of yellow beeswax have increased greatly each year in the last few years owing to developments in the preparation of floor polish and other polishes in the Union. Nearly all of this wax now comes from East African ports. The imports of wax and of foundation during the year, and the number of consignments admitted, were as follows according to the inspectors' returns:—

IMPORTATION OF BEESWAX AND FOUNDATION COMB.

Inspection Centre.	Yellow Wax. lbs.	Cera Alba. lbs.	Foundation Comb. lbs.
Cape Town	—	155 (2)	345 (2)
Durban	80,545 (9)	280 (4)	—
Port Elizabeth	—	168 (2)	—
East London	—	—	190 (3)
Johannesburg	62,692 (15)	—	—
Pretoria	336 (1)	—	100 (1)
Total ..	143,573 (25)	603 (8)	635 (6)

24. *Locusts.*—The entire Union was free from any authentic reported occurrence of swarms of hoppers of either of the two species of migratory locusts throughout the year; and this immunity can be safely attributed to the locust destruction operations of the past few years. I feel no dout that had it not been for the Government work, the country would have had a very severe visitation. In the early winter one winged swarm, suspected to have come from the desert, arrived and is thought to have remained on farms on the Kuruman-Hay border; and one or more others, thought to have originated in the desert to the east of Upington, migrated south and scattered over farms where the Victoria West, Murraysburg and Beaufort West districts adjoin. It was feared that outbreaks of voetgangers in those parts would result from these visitations, but none materialised. In December, one large winged swarm, thought to have flown east from the desert, was

reported near Geluk in the Vryburg district; and in April, that is just after the close of the year covered by this report, a swarm was reported to have been seen in the south-east of the Kenhardt district. No swarms elsewhere were reported, but solitary flying locusts were collected during the summer in several localities near the Orange Free State-Griqualand West border. The several occurrences thus far mentioned all refer to the brown locust (*Locusta pardalina* or *Pachytylus sulcicollis* as it was long known). A flying swarm of the other plague species, the red locust (*Cyrtacanthacris septemfasciata* or *Acridium purpuriferum* as it was once called), was reported to the Portuguese Government at Lorenço Marques from Inhambane during December but, owing to the influenza epidemic then raging in the area, positive confirmation of the report could not be obtained. In the same month a single flying specimen of the species was caught by one of the Division's officers near Tzaneen in the northern Transvaal; and in March a few voetgangers taken to be of the species reached the Rhodesian entomologist from the Mazoe district of his territory. Evidence that the plague locusts remain in South Africa during the long periods when no swarms are observed therefore continues to accumulate.

25. Locusts birds, large and small, of the several common migratory species were reported to be very numerous by many observers. It is thought that more came to South Africa in the year reviewed than in the recent years when there were locusts for them to devour. In some Transvaal and Natal districts, locust birds, especially the white stork, were highly beneficial through preying upon the army or mystery worm, a pest of the saeson to which a paragraph will be devoted later in this report. Some farmers reported the white stork to have visited their localities in thousands; one stated that he thought there were at least six thousand feeding on the caterpillars in the lands and veld near Delmas in the Transvaal. About three hundred fed on the caterpillars that infested town lands in Pretoria.

26. On the request of the Division, Dr. Ernest Anderson, the professor of agricultural chemistry at the Transvaal University College at Pretoria, gave a great deal of his time during the year to a study of chemical problems in connection with what has come to be known as South African locust poison. The poison, as prepared, is merely a mixture of a concentrated water solution of arsenite of soda with treacle or a concentrated water solution of sugar. Whether crude mill treacle, refinery treacle, crude sugar, or refined sugar was used as the sweetening agent had depended largely upon what was available and quickly obtainable when poison had to be prepared. Until a few years ago the mixture was made to consist of one measure of water containing 10 lbs. of arsenite of soda to the gallon with two measures of treacle or a sugar solution containing 10 lbs. of sugar to the imperial gallon. Later the practice became to dissolve 112 lbs. of the arsenite in water, bring the quantity to 10 gallons and then mix with 24 gallons of treacle. It has always been recognised that a deposit commonly formed in the poison after it had stood a long time; and, in recent years when crude mill treacle was used, it has been a frequent experience to have the mixture thicken at once to the consistency of porridge. The deposit that has formed on long standing has varied greatly in appearance and apparently in character, and different mixtures have varied in colour and in other respects. Dr. Anderson's investigations were to find explanations for these differences and to learn if the changes that took place seriously altered the toxicity and the sweetness of the preparations so far as could be determined chemically.

27. In respect of arsenite of soda Dr. Anderson has found that a solution of the desired strength (1.80 to 1.84 sp.gr.) will keep indefinitely if the proportion of soda (Na_2O) to white arsenic (As_2O_3) shown by analysis is about 2 to 8 or 2 to 9 as in the case with the British-made arsenites that have been examined; but that there is a loss by crystallisation and also by precipitation if the proportion of soda to white arsenic is much lower as is the case with all Australian and South African-made arsenites that he has analysed. One solution of arsenite that analysed about 11 per cent. Na_2O and 82 per cent. As_2O_3, precipitated 18 per cent. of its arsenic as white arsenic while it was cooling. It has consequently been concluded that for use in making locust poison an arsenite of soda should contain soda to the extent of two parts to nine of white arsenic.

28. Treacles were found to cause chemical change chiefly in proportion to the extent to which they contain (1) lime and (2) invert sugars. Crude mill treacle contains so much lime that up to about one-seventh of the arsenic may be converted into arsenite of lime, the product which was found to cause the thickening of fresh mixtures; but refinery treacle contains very little lime. At first the arsenite of lime dissolves when the mixture is diluted to the extent recommended for use; but in the course of time it settles to the bottom of the containing vessel and becomes more and more insoluble. The sludge, however, is one that is relatively easy to stir into the solution and the mixture is not thought to lose very much in toxicity because of its formation. Mill treacle, which is concentrated cane juice treated with chemicals and exhausted of as much sugar as can profitably be taken, contains practically as much sucrose or ordinary sugar as refinery treacle, which is a much purer product and is what remains after sugar as it comes from a mill has been melted and refined; but while refinery treacle contains about as much other or invert sugars as it does sucrose, crude mill treacle contains far less. The mill treacle of which many thousands of gallons were used in making locust poison for the last locust campaign con-

tained only about 13 per cent. of invert sugars while the refinery treacle that was used contained about 34 per cent. Dr. Anderson has found that the arsenite solution and the invert sugars slowly act on one another and that the action results in a gradual loss of sugar and in the precipitation of white arsenic. The arsenic when thrown out by refinery treacle cakes hard and cannot easily be mixed with the solution. The consequent losses are considered serious in the case of refinery treacle but not in the case of the crude treacle. The ultimate losses from solution in the case of mill treacle poison is regarded as about 8½ per cent. of sugar and 13 per cent. of arsenic calculated as white arsenic; while in the case of refinery treacle poison it is about 30 per cent. of sugar and over 20 per cent. of white arsenic. Mill treacle, which costs only 1½d. per gallon, is consequently now deemed better for making locust poison than refinery treacle, which costs nearly a shilling a gallon.

29. Refined sugar and arsenite of soda in solution act very little if at all on one another; but, owing to its high cost, refined sugar would not be used by the Division in making locust poison other than in an emergency. Crude sugar has had little study in this connection, but one lot tested was found to produce a copious formation of arsenite of lime. Crude sugar would now be given preference by the Division were mill treacle not available.

30. Heat naturally expedites the various chemical reactions that take place in locust poison and Dr. Anderson therefore advises the Division always to let the arsenite solution cool before the sweetening agent is added to it. He suggests that the two ingredients be poured separately into the drums in which the poison is to be transported and that they not be stirred until just before the preparation is diluted for use. Tests have demonstrated that the treacle or sugar solution will float on the arsenite solution indefinitely. In the case of mill treacle, a membrane of arsenite of lime soon forms where the two solutions are in contact and this tends to hold them apart. As the outcome of Dr. Anderson's studies, the Division now has sound knowledge, previously quite lacking, on which to base the selection of the ingredients for locust poison and on which to base methods of preparation. His studies were made without expense to the Government.

31. *European Foul Brood.*—The discovery of European foul brood in the Malmesbury, Paarl, Cape and Caledon districts in the extreme south-west of the Cape Province was recorded in the last annual report; and the very bad reputation this bee disease has in other countries led me to have much time spent on it during the past year. The Government does not employ any bee or bee disease specialist as such; but the Division is fortunate in having a practical "bee expert" on its staff in the person of A. J. Attridge, the plant inspector at Cape Town. Mr. Attridge is chairman of the W. P. Beekeepers' Association and editor of the *Western Province Bee Journal.* During the year I had Mr. Attridge make several tours of observation in the Berg River-Hopefield area where the disease first came to light and was thought to have been very severe in the 1915-1917 seasons; and in September-November had him make a tour of inspection in the Transvaal, Natal, and eastern Cape Province. His long tour of inspection had to be curtailed greatly owing to the influenza epidemic but it was carried out quite enough to secure positive evidence that the disease is widespread in the country. I am of the opinion that it is practically omnipresent amongst bees in South Africa, but that it is exceptional for it to ravage colonies very seriously. Mr. Attridge found a few dead larvae in the majority of the colonies he examined on his long tour but only found a few colonies much diseased and more often than otherwise in these cases the trouble present appeared to be entirely apart from foul brood. The most pronounced cases of foul brood were in apiaries of experienced beemen who were incredulous when informed of its presence. Mr. Attridge took specimens for microscopical study from most colonies in which he suspected foul brood, taking full frames of brood in many cases, and forwarded these promptly to Pretoria. The material thus obtained was subjected to close study by C. K. Brain of the Division and by the writer. In the course of the laboratory work many hundreds of stained smears were examined and a goodly number of bouillon cultures made of organisms found in dead or dying larvae. Some of the organisms have not been identified with any organism described as associated with bee larvae; and while it seems safe to accept that most of these are non-pathogenic there is some reason to think that a few of them may be the cause of specific disease of some kind or kinds distinct from foul brood. The particular organism, *Bacillus pluton*, which has been shown by prolonged investigation of officers of the United States Department of Agriculture to be responsible for European foul brood, was, however, found in many lots of the diseased brood; and, as described by the American experts, the organism *Bacillus alvei* was commonly found to be in the same samples. *B. pluton* was characteristic of the gut of sick but still living larvae of brood having the naked-eye appearances of European foul brood while *B. alvei* was found in the same comb in larvae far advanced in the disease and also in dried down scales. In this way evidence, which I think unquestionable, was obtained that European foul brood was certainly present in colonies inspected at Elgin (Caledon district, C.P.) and in or near Potchefstroom, Johannesburg, Pretoria, Rustenburg, Durban, and Queenstown. The presence of this particular disease in the Berg River-Hopefield area was established by indentifications made by U.S.A. Government experts

at Washington a year ago, and in our subsequent work we have found the characteristic organisms in material from several of the apiaries there. What from microscopical study we strongly suspect was the disease was found also at Cedara (Natal), Bloemfontein and Sterkstroom, C.P.

32. I am pleased to be able to record that the condition of apiaries in the Berg River-Hopefield area in respect of disease has immensely improved. Mr. Attridge, under instructions, spent nearly a week during December in making an inspection of the principal stands. He found the great majority of colonies to be strong and working well and without obvious signs of disease. Only in very exceptional colonies did he find much dead brood. He sent full frames from seven such diseased colonies at as many places to Pretoria for study; and only in specimens from two of the places were the typical European foul brood organisms demonstrated. In all the other cases there were found only organisms that are believed to be saprophytic, and it is conjectured that the brood died owing to being subjected to bad bee-keeping conditions. Colonies having ceased to die out and the production of honey having again become satisfactory, without the application of measures to suppress foul brood, I think that the heavy losses in 1915-1917 must have been due far more to unfavourable seasons in association with negligent bee-keeping than due to foul brood. It may be worth recording here that according to an American Government report honey is almost invariably sterile, that is free from bacteria, etc.; but that, in the study of material from Hopefield, Mr. Brain obtained a growth believed to be of *Bacillus orpheus* in two out of three culture tubes inoculated with honey from a diseased comb. It may also be of interest to record that he grew *Bacillus alvei* from scales out of a comb that had been taken from a hive at Potchefstroom over two years before.

33. The Government of Southern Rhodesia placed a prohibition (G.N.442 of 1918) on the importation of Western Province honey when the presence of European foul brood in the Union was first announced; but very sensibly withdrew the restrictions entirely (G.N.62 of 1919) when it was learned that the disease in a mild form was widespread in the Union.

34. The American experts identified sacbrood, an infectious brood disease much less feared than foul brood, in some of the material sent by the Division from the Berg River-Hopefield area; and traces of what I believe to be this second disease were found in samples of diseased brood collected by Mr. Attridge at Elgin, Pretoria, Johannesburg, Rustenburg, Durban, Pietermaritzburg, and Kubusie, C.P. It is therefore considered that sacbrood, like European foul brood, is widely prevalent in South Africa.

35. The inspections because of the foul brood disease have emphasised to the Division the regrettable neglect of the Government in respect of bee-keeping. Beyond restricting certain imports as a measure to keep out bee diseases, action which protects the honey industry in South Africa from overseas competition, the Government does practically nothing to help on apiculture. It is true that apiculture is included amongst the minor subjects taught at certain of the department's agricultural schools; but the provision for teaching the subject is wofully deficient. In my last annual report, I argued against the imposition of any Government regulations on the keeping of bees on the ground that the beekeepers needed education, not legislation, and I desire here to repeat my concluding remarks. They were:—

> While now decrying legislative measures both in respect of the keeping of bees and of traffic that may spread foul brood, I would heartily favour the adoption by the Department of an active policy of itinerant instruction to encourage bee-keeping and to spread a knowledge of proper methods for combating bee diseases and pests. After such work was well established compulsory legislative measures would be open to fewer objections. Great care should be given to the selection of instructors, and I would urge that any permanent senior posts be reserved for men specially educated to fill them. I advise that one or two scholarships be given as early as practicable, and an occasional one in future years, to selected dual language South Africans to qualify as bee specialists by study and training in America. The men should get a broad and sound education in general agriculture and horticulture, and after acquiring a more detailed knowledge of entomology and botany should specialize on bee problems, to this end studying and taking service for a time in one or more laboratories dealing intimately with both practical and scientific phases of the subject. The necessary arrangements for the special training could be made very easily. While specialists are being educated and trained I think the Department might well give official recognition as bee expert to Mr. Attridge, who is probably as well fitted to serve in that capacity as any man available in the country, and who possesses the great advantage of having proved his merits by bee work for us.

36. *Pernicious Scale.*—Pernicious (San José) scale continues to make headway in and around Pretoria, and generally in the Transvaal high veld places where it became established with the distribution of infested nursery stock prior to its discovery in 1911. It was again found in all of the registered nurseries in Pretoria, and it is now so common in private gardens about these several nurseries that the nurserymen cannot be expected to succeed in keeping it from their stock. This does not mean, however, that there is much risk of it being sent away from Pretoria on stock from these nurseries. On the one hand,

very few fruit trees are now kept in stock at any one of them, and on the other hand the stock is inspected over and over again during the year, and any woody plants are fumigated under the supervision of the inspector before they are sent away. A slight infestation was found last year in the only fruit tree nursery of consequence near Pretoria, one at East Lynne. near Derdepoort; and in the present year a further slight infestation was found there. The outbreaks appeared to be independent, but to have come from a common source, a private orchard 200 yards distant.

37. The outbreak in Parktown, Johannesburg, still appears to be confined to a small group of properties. It is held in check by winter spraying carried out by the municipal park department. Our Johannesburg plant inspector each year inspects the locality, and on the last occasion found the pest in seven gardens. There is also a small outbreak, dating from 1911, or before, at New Clare, in the western part of Johannesburg. The occupiers of the infested properties are succeeding in holding the pest well in check by spraying, but it must be expected that, in time, it will get out of hand both there and at Parktown. A third Johannesburg occurrence has just come to light in a small nursery in the Geldenhuis Small Holdings in the Bezuidenhout Valley, towards Germiston, but it is hoped that it has already been wholly eradicated. This outbreak was traced to a removal of trees from a property at Eastleigh, near Edenvale P.O., a few miles to the north, and a visit to the latter locality has shown that the pest is there thoroughly established in a number of small orchards. A fourth infestation near Johannesburg recently came to notice at Bergvlei, on the main road to Pretoria. It is believed to be due to trees from a suspected nursery planted on the property in 1910 or 1911. An inspection of the orchard in 1912 failed to disclose it, and as the proposal to attempt to exterminate the insect was dropped shortly afterwards no subsequent inspection was made. It is presumed that the infestation was extremely slight at first, and that for years it made only slight progress; now it is well developed, and is likely to have spread to a number of other orchards. I fear that in a decade or so the insect will be an important pest in small holdings all around Johannesburg. One of the first spreads from Pretoria was to the farm Putfontein, a few miles north-east of Benoni. I visited this farm a few months ago, and found the pest thoroughly established in an orchard of about a thousand trees, about a quarter mile across open veld from the long-infested one. The farm has been greatly subdivided, and now carries a number of small orchards. The next farm to the north, Zesfontein, now has even more small orchards, while to the west of Zesfontein lies a farm, Rietfontein, that is being planted to apples and sold in 5 acre plots by a company.

38. One of the first discovered outbreaks of the pest was at Viljoen's Drift, on the Transvaal-Orange Free State border. Owing to its extensive orchards a few miles away, the Vereeniging Estates had co-operated with the Division at the time in an attempt to eradicate the outbreak by the destruction of all the food plants of the insect in the affected gardens. That the operations were not extensive enough was indicated this year by the finding of the pest on rose plants in gardens near by those that were devastated. An officer of the Division chanced to visit the locality and searched for the insect. No previous inspection had been made since the year following the attempt at eradication.

39. No occurrence of the pest is known anywhere in the Cape Province or in the Orange Free State elsewhere than at Kroonstad and Viljoen's Drift; but year by year, with its progressively rapid spread in the Transvaal and Natal the danger increases of its being accidentally taken to new regions. The time is certainly coming when despite of all regulations, the insect will reach and become a common pest in practically all parts of the Union where deciduous fruits are grown commercially. So far as the high veld is concerned, I should like to add, however, that woolly aphis is a much more formidable apple pest.

40. *Insect Pests on Small Holdings.*—The Union appears to have entered an era of rapid development in the number of small agricultural holdings. I believe the Government should lose no time in adopting a clear cut and aggressive general policy to keep the development in this direction in desirable channels; but I desire in this report merely to touch upon a phase of the subject that directly concerns the work of the Division of Entomology. To have the small holding a success, intensive cultivation and the efficient control of insect pests is essential. With the increase of small holdings, therefore, there must follow more and more demand for advice and practical assistance on insect problems. The settlers, to a large extent, will be from the towns or from oversea; and it may safely be assumed that they will have practically everything to learn about fighting pests both of the orchard and of field and garden crops. We already have a foretaste of what is coming by our experience at the Sundays River Settlements. The settlers are keen to get entomological help; but they are so ignorant of fundamental facts concerning their insect troubles that it is difficult for the Division to give them the instruction they need without devoting altogether inordinate time to the task. To satisfy the demands, an instructor should be permanently resident in such a settlement. At present the settlers think they should have more attention from the Division, but it is impracticable to give them more without seriously neglecting duties of wider utility. And, although they may not realize it, the settlers on small holdings probably need help in respect of farming methods and other phases of their calling quite as much or more than they need help in overcoming insect troubles. Their insect problems are largely ones on which they could get needful

information and advice quite as well from a general agricultural or horticultural "advisory officer" as from an entomological specialist. The general officer would naturally correlate his advice on insects with his teaching on related matters, and thus probably be more helpful to the novice. I am of the opinion that the time is rapidly approaching when many field advisory officers will be urgently needed to supplement the work of the entomologists and other specialists of the Department. Their sphere of service will be that of acting as intermediaries between the specialist and the farmer; that is, of explaining to the farmers the practical application of the investigations and findings of the technical officers to their individual difficulties. I hope the Government will prepare for the need by introducing a sound policy to get young men specially educated and trained, and by devising a plan to secure employment for the men when they are qualified. Government initiative and assistance seem necessary to provide such officers in sufficient number and with proper preparation; but some satisfactory scheme might be devised to have the employment costs for each officer in whole or in part borne by the residents of the area for which he is engaged. The need for competent orchard advisory officers was discussed in section 13 of my last annual report.

41. *Cotton Insects.*—In view of the potential importance of cotton as a staple crop for the middle and low veld, coupled with the fact that many of the pioneers in the industry have been much disheartened by losses attributed to insects, the Division has begun to pay special attention to the insects that attack the cotton plant and to measures for their suppression. Towards the close of the year under review, Assistant Entomologist G. C. Haines was transferred from special work on wattle insects in Natal and stationed at the Tobacco and Cotton Experiment Station at Rustenburg so as to keep the Division in closer touch with the cotton growers; and throughout the year Entomologist C. K. Brain gave special attention to cotton insect problems. A 29-page account of the cotton insects known in the country was published during the year and a copy of the publication sent to each one of a large number of farmers known to have tried or to be about to try the crop. It is believed that much of the trouble put down to insects in the 1917-1918 season was really physiological and due to climatic condtions of the season; and it seems probable that in the more humid districts bacterial disease is responsible for much damage blamed to insects. But insects do levy a surprisingly heavy toll when it is considered that cotton is an entirely new crop within a few years on most of the farms where it is being grown. The explanation is the occurrence of a number of native plants allied to cotton from which the insects spread at once to cotton. It was feared that the pink boll worm, the insect that has proved so tremendously destructive in Egypt, might already be in the Union; but no indication of it, or of any insect analagous to the equally notorious Mexican boll weevil, has come to light. Three "boll worms" occur, the Sudan (*Diparopsis castanea*), the spiny (*Earias insulana*), and the common American (*Chloridea obsoleta*); and these appear to be of importance both in the Transvaal and Natal in the order they are named. The Sudan species comprised about 90 per cent. of the worms observed in bolls at Rustenburg this season. Entomologist van der Merwe, who is paying intermittent attention to cotton insects on the Natal coast, states that a boll worm which from the description given of it is likely to be this species, is said by an old inhabitant to have been the chief reason why cotton growing was abandoned in Natal fifty years ago.

42. *Mystery Army Worm.*—The summer of 1918-1919 will go down in the agricultural annals of the eastern half of the Union as a season when caterpillars were most extraordinarily abundant. 1878 is still talked of as the caterpillar year, but 1919 is likely to be ranked as the more infamous of the two years. In order to form a convenient record, rather extended mention of the matter is made here. The species of insect concerned this season was *Laphygma exempta,* and there is no reason to doubt that the great outbreaks in 1878 and minor outbreaks of such an insect in several intervening periods, notably in 1908-1909 and 1914-1915, were of the same species. Outbreaks have been characterized by the sudden and unexpected appearance of the caterpillars in great numbers in large patches over wide areas of grass land and by the almost equally surprising complete disappearance of the pest in a few weeks. The mysteriousness of the event and the fact that the caterpillars positively swarm where they are seen at all, and tend to move in mass formation when their food supply is exhausted, has suggested the popular term of "mystery army worm" that I apply to the insect. Full advantage was taken of the opportunities presented this season for getting light on the habits of the creature and of testing the value of measures for its destruction that could be experimented with at Pretoria. The entomologist stationed at Durban, C. P. van der Merwe, gave prolonged attention to the insect, while for several weeks J. C. Faure, of the Pretoria staff, and the writer himself gave most of their time to work on it.

43. The caterpillar is a slim, smooth, faintly striped, blackish caterpillar that when full grown measures about one and one-third inches in length. It feeds almost exclusively on plants of the grass family not so much advanced in growth as to lack succulency. It is impossible to estimate even roughly at this time the extent of the losses that were inflicted. The damage to unimproved veld was probably of small account in sections that were ravaged before March, as there was time for the grass to grow again before winter; but in the southern Orange Free State, which was ravaged in April, many farms are said to have lost all their winter grazing. The loss in teff grass was very severe on numerous

farms in the high veld and in Natal. Other cultivated grasses were eaten to the roots. Young maize commonly suffered severely, and in some cases was eaten to stumps a few inches high. Old maize, in general, suffered only slightly. The caterpillars commonly moved through maize lands and merely fed on the grass and on the maize leaves near the ground. Similarly they were reported to clean the grass from lucerne land without molesting the lucerne. Oats and kafir corn and other small grains were freely eaten.

44. There seems no escape from the conclusion that the insect in its moth stage is migratory and that in a few days it may traverse several hundred miles. It is hardly correct to call the insect migratory in its caterpillar state. Its movement then is not mostly in one direction, as in the case of voetganger locusts, and it is obviously in search of food or of suitable ground in which to pupate. Some apparently creditable reports, however, indicate that the caterpillars may advance fully half a mile in the course of a fortnight. The main outbreaks of the pest this year were progressively further south and west with each generation; and, curiously, the new series of outbreaks seemed to begin about where the former series ended. The earlier reported outbreaks were in and about Lourenco Marques and in Zululand and the Transvaal low veld in early January. The streets of Lourenco Marques are said to have been foul for days with the odour of caterpillars crushed by traffic. The next series of outbreaks, reported from 7th February onwards, extended across the Transvaal to the Rustenburg and Potchefstroom districts, into the northern tier of Orange Free State districts, and southwards through Natal and along the Transkeian coast into the Willowvale district. At the same time outbreaks occurred near Grootfontein, in the north of the South-western Protectorate, and here and there in Southern Rhodesia. These outbreaks subsided early in March; and at the end of that month a third series started still further to the south and west. The third series extended into Bechuanaland as far north as Mafeking, over at least the eastern side of Griqualand West, over the western, central and southern districts of the Orange Free State and the adjoining northern Cape districts, and southwards along the coast into the Peddie district, and westwards from the coast over the remaining Transkeian area and into the eastern Cape districts as far as Bedford. In nine weeks, 11th February to 15th April, unsolicited reports of the caterpillar reached the Division from 34 districts of the Union.

45. Extremely numerous as the moths must have been, they attracted attention in very few localities. They hide during the day, chiefly in grass stubble it is thought, and at night seek honeydew and nectar as food. Lights have very little attraction for them. It was discovered that cripples and newly emerged specimens composed nearly all the moths present in grassland where caterpillars had been abundant, and this observation suggests that the able bodied moths migrate very soon, perhaps within a day, of the time they emerge. Moths under observation in early March generally laid eggs within four days of their emergence. The eggs are placed regularly in oblong batches usually of one hundred to three hundred. About Pretoria it was noticed that a favourite place for laying was the underside of the foliage of the common milkweed. Many batches were also found on woodwork, and it is thought that the moths are not at all particular where they lay. Entomologist van der Merwe at Durban found batches day after day on linen left on the clothes line overnight, and this when there seemed to be very few of the moths about. The clusters are covered with dark grey down from the body of the mother insect, and the covering gives the cluster the appearance of a thin layer of black cotton wool. Where moths are known to have been observed in great numbers there has been a relative absence of shelter in which they might have hidden. Moths innumerable of what from the examination of rubbed specimens at the time was thought to be the kind under discussion came unpleasantly to the notice of Union troops at Swakopmund in the late summer of 1914-1915. Lieut.-Col. G. W. Lee, A.D.V.S. at Windhuk, mentioned the occurrence in a recent letter. He wrote: "In March four years ago, during the campaign, a strong easterly wind drove clouds of the moths to the coast at Swakopmund. The majority perished in the sea, and since then nothing further was heard or seen of the plague until this year."

46. The number of generations of the insect in the year must vary greatly with the temperature and with the food supply. At midsummer on the Natal coast the full generation did not seem to take over five weeks, while in early winter in our office rooms at Pretoria a later generation took double as long. Under favourable conditions for development, the egg stage takes about 3 to 7 days, the caterpillar stage 2½ to 4 weeks, and the pupal stage 9 to 19 days. Three weeks for the caterpillar, two for the pupa, and one from the emergence of the moth to the hatching of its eggs was approximately the duration of the February-March generation at Pretoria.

47. As mentioned elsewhere in this report, locust birds preyed heavily on the caterpillars. Infectious disease is probably an important check on the insect in the long run, yet no very extensive outbreak came to the attention of the Division this year. Mr. van der Merwe found polyhedral wilt to a slight extent at Durban, and what we identified as this disease was reported to have destroyed millions of the caterpillars near Estcourt, Natal. Several species of wasp and fly parasites were reared from the caterpillar in the course of the studies at Durban and Pretoria; but, on the whole, parasites did little to check the insect this season.

48. Briefly summarized, the conclusions reached by the Division in regard to measures

for dealing with the caterpillars are as follows:—It is impracticable to combat the pest in the veld, and probably nothing better can be done in the case of heavily infested sown grasses than to turn them into hay as speedily as possible. Only under very exceptional circumstances can rollers and drags be advantageously used to crush the worms. Sometimes an advance over open ground can be effectively held up by strewing fresh cut grass or maize plants across it, and by shaking off and crushing underfoot the worms that tarry to feed or rest. The worms take "poison bait" readily; and when a land is threatened by an advancing army it is recommended that one or more furrows be ploughed across the line of march and baited to poison the worms. Arsenite of soda answers excellently as the poison, and sugar or treacle adds to the attractiveness of the carrier. Bran is taken by the worms even if not sweetened; but it is thought desirable to add about five pounds of sugar or half a gallon of treacle to a pound of arsenite in making bait. Good results have been obtained with two pounds of sugar to one of arsenite, that is with the proportion used in Government locust poison. Finely cut maize or sweet grass of any kind, bran, or even pulverised horse dung in emergency, may be used as the carrier. The arsenite of soda should be dissolved in water at the rate of one pound to sixteen gallons, the sweetening added, and the carrier wet with this solution. It takes about one gallon to moisten ten pounds of bran or fine grass, or about fourteen pounds of maize leaves, or seven pounds of dry horse dung. Any green stuff used should be freshly cut and succulent; it can be satisfactorily wetted by immersion, but bran or dung should be sprinkled and worked over and over until uniformly of the desired dampness. A dung bait is rather hard to prepare and spread. Ample care should be taken to keep stock from eating bait. Furrows may be freshly baited without risk if the precaution is taken to harrow them to bury the surplus bait before giving stock a chance to come near. Bait may also be used with safety on lawns and other grass lands if broadcasted very thinly. There should be no pieces or lumps that an animal could easily pick up. One hundred pounds of green stuff or bran is ample to spread over an acre. Most of the worms may be expected to die well within twenty-four hours. A furrow should be rebaited every few hours while the caterpillars are advancing, as moisture is a factor in attracting them. Lawns and lands had best be baited late in the afternoon, and one treatment should be enough.

49. *Maize Insects.*—The snout beetle (*Strophosomus amplicollis*), which in last year's report was stated for several years to have interfered seriously with the culture of maize and other staple crops near Warmbaths, has dropped out of notice again.

50. Cutworms in the spring of 1919 were most exceptionally troublesome to maize in the high veld of the Transvaal, and in Natal and the north and east of the Orange Free State. Many farmers sowed parts of their lands three times in succession. The time when the pest worked greatest havoc varied from place to place, but, in the high veld generally, it was chiefly in the latter half of November. A circular letter of enquiry was sent to all members of the maize association, and was published in leading agricultural papers; but the information received in reply was disappointing by its lack of preciseness. The outstanding fact brought out was that winter ploughed lands suffered very little compared with lands ploughed only a short time before they were sown. It is conjectured that the phenomenal prevalence of the pest was correlated with the soaking and quite abnormal rains that characterised August coupled with the unusual warmth and ample rains of September and October. The warm, early spring may reasonably be supposed to have been very favourable for the rapid development and increase of the insect.

51. The maize stalk borer was also remarkably in evidence in the high veld, Natal, and northern and eastern Orange Free State. On farm after farm over large areas hardly a stalk came to maturity without suffering from the insect, and it was common for every node of a plant and the stems of the cobs to be infested. The severity of the pest is thought to be explainable by the peculiarities of the season mentioned in the foregoing paragraph on cutworms. The insect normally develops two generations, and a partial third generation. In this season, the third generation appeared to be a practically full one. It is very difficult to judge how much loss was due to the insect; but at the time of writing the crops of the maize districts of the southern Transvaal and the northern Orange Free State, that is of the principal maize districts of the Union, are said to be fully 25 to 35 per cent. below normal. Part of the deficiency is ascribable to cutworms, and part to the dryness of the summer; but I think the borer has been the chief factor. The maize harvested, moreover, will average much poorer in quality than in the normal year owing to the direct and indirect damage done by the insect. Many farmers are said to be so disheartened by the gravity of the stalk borer problem that they declare they are finished with the commercial cultivation of maize for grain. A voluminous treatise on the insect and on measures for its control has been prepared by C. W. Mally, the Cape Entomologist. This account embodies the results of years of study on the subject, and its projected publication renders further discussion of the insect in this report unnecessary.

C. P. LOUNSBURY,

Chief, Division of Entomology.

APPENDIX X (*a*).

DIVISION OF CHEMISTRY.

Staff.—The staff of the Division consisted of: Assistant Chemists, B. de C. Marchand, B. J. Smit; Analytical Assistant, H. F. L. Bischoff; Office and Laboratory Assistant, F. Shilz, J. Sarkis. F. Schilz left in September, 1918, and J. Sarkis was employed in his place. In January, 1919, Miss C. Mare was transferred to the Division from Head Office as typiste and clerical assistant, and A. M. Crossthwaite was also temporarily transferred for a fortnight in connection with the transfer of the administration of the Fertilisers, Farm Foods, Seeds, and Pest Remedies Act to the Division. D. J. R. van Wijk was appointed on January 2nd, 1919, as Assistant Chemist (temporary).

Analytical Work.—The samples received for analysis or examination were: Soils and Subsoils, 70; Fertilisers, 56; Feeding Stuffs, 12; Phosphate Rock, 10; Kraal Manure Ash, 10; Water, 4; Maize, 5; Bat Guano, 6; Limestone, 7; Miscellaneous, 10; total, 190.

Soils.—30 of the soil samples came from the Groenkloof Experimental Station and were examined in connection with the effect on the veld of grass burning. The collected data regarding the soils of the Pretoria District were collated and we now have this area fairly well mapped out, so that in future it will be necessary to make but few analyses of soils from this district as samples can always be referred to the known soil types. The advantages of such soil mapping are enormous, duplication of analytical work is avoided, the difficulties of giving advice on the basis of a mere analysis alone largely overcome and there is less delay and expense incurred when such advice is to be given.

None of the soils analysed call for any particular comment.

Fertilisers.—The majority of the 54 fertilisers samples analysed were of commercial articles. The average quality was good considering all circumstances. A notable feature was the absence of samples containing phosphoric oxide soluble in water, most of the mixtures consisting of bone, Karoo ash and some nitrogenous matter. Of the samples of supposed phosphate rock, only one, a sample from the Prince Albert district, contained any appreciable quantity of phosphoric oxide. The sample in question, which was essentially a phosphate of lime, contained 14 per cent. of phosphoric oxide. This material is too poor to permit of chemical treatment of any kind, but might be successfully used in a fine ground state.

Tobacco.—36 samples of tobacco representing practically all types grown in the Union were collected and submitted for determination of the nicotine content by the Chief of the Tobacco and Cotton Division in December and January, 1917. The bulk of these were analysed during the period under review. The results indicate that most of our tobaccos do not contain much nicotine, the average amount for all samples, except Turkish tobacco, being under 2·5 per cent. The inferior grades of tobacco contain as a rule less nicotine than the better grades, light cigarette tobaccos excepted. This has an important bearing on the question of the manufacture of nicotine extracts. It is obviously impossible to use high grade tobacco for this purpose and the results of these analyses indicate that the waste tobaccos are, as a rule, poor in nicotine, the inferior tobaccos valued at not more than 3d. per lb. containing an average of less than 2 per cent. of nicotine. These results confirm the opininon expressed by Dr. McCrae ("Transvaal Agricultural Journal," IV., 15, 536) that Transvaal tobacco "is not sufficiently rich to encourage one to believe that the preparation of extract could be profitably carried on in competition with the imported articles," with extension of the opinion to cover tobacco grown in the Union. It is true that the inferior Oudtshoorn tobaccos were found to contain slightly more, 2·5 per cent. of nicotine but the higher grades from this district averaged nearly 4 per cent.

Feeding Stuffs.—The feeding stuffs examined consisted of a number of South African grasses and other plants.

Investigational work.—Experiments on the interaction between certain fertilisers and some of our typical soils were continued. A little work was also done in connection with the solubility of phosphatic fertilisers in citric acid.

Two methods of analysis were investigated, one, which promises to be useful from a time saving point of view, being the determination of calcium by weighing the oxalate as proposed by Goy (Chemiker Zeitung, xxxvii., 131, 1337) and the other the determination of potash by precipitation first as cobaltinitrite followed by solution and reprecipitation as perchlorate.

Since the examination for accuracy of glassware used in testing milk and cream has been partly charged to this Division, a considerable amount of work was done in order to arrive at the most suitable methods from the point of view of accuracy and expedition for testing such glassware. It is essential that, where large numbers of graduated vessels are to be tested, the methods employed should be rapid and at the same time accurate. As very little appears to have been written on the subject, especially in connection with Gerber tubes, a considerable amount of work was involved.

Administration of Act 21 *of* 1917.—From January 2nd, 1919, the administration of the Fertilisers, Farm Foods, Seeds and Pest Remedies Act was transferred to this Division. This involved a great deal of additional correspondence, keeping the registration books, distribution of samples to be analysed among the various laboratories of the Department, and administrative work generally. Under this Act and the regulations framed under Section 7 thereof, all fertilisers and farm foods sold within the Union must be registered with, and the chemical composition made known to, the Department. Sellers are then required to furnish each purchaser with an invoice stating the chemical composition of the articles and other particulars prescribed by Act and Regulations. Owing to the state of affairs brought about by the proclamation of Act 21 it was not deemed advisable to commence the purchase of samples for a few months. Consequently the sale of fertilisers was not controlled by the purchase and analysis of samples during the period under review.

Registrations.—During the period 2nd January to 31st March, 1919, 125 fertilisers and 13 farm foods were registered, 17 fertilisers and 3 farm foods having been registered during the period 29th November to 1st January, when the administration was in charge of the Head Office.

The fertilisers registered may be classified as follows:—Mixed Fertilisers, 96; Superphosphate, 6; Bone (including Bone Meal, Bone Dust, etc.), 19; Bone Superphosphate, 5; Dissolved Bone Compound, 3; Sulphate of Ammonia, 1; Basic Phosphate, 1; Guano, 2; Blood Meal, 1; Bat Guano, 1; Whale Guano, 3; Fish Guano, 1; Guano Phosphate, 2; Nitrate of Soda, 1; total, 142.

Of these registrations 8 have been withdrawn while 24 have been cancelled owing to non-compliance with the amended regulations as laid down in Government Notice No. 436 of 1919. The large proportion of mixed fertilisers is noticeable. There is no doubt that the number of mixed fertilisers as compared with others is due to war conditions. The "one constituent" fertilisers, such as superphosphate, basic slag, nitrate of soda, potash salts, were nearly all imported. The shortage has caused a number of fertiliser factories to open in this country, and these produce mixed fertilisers for the most part. Reference to the registrations effected in previous years under Act 20 of 1907 (Cape) shows that the proportion of mixed fertilisers has increased enormously. Whether this is altogether desirable is a matter for doubt. In the first place one cannot lay down hard and fast rules as to the composition of fertilisers for various crops in a country like this. The most suitable mixture in one case may not at all be suited for use in another. There can be no doubt that the use of mixed fertilisers is much more wasteful than the use of one constituent fertilisers, for should a farmer buy a mixture containing nitrogen, phosphoric oxide and potash when conditions require no nitrogen, the money represented by the value of the notrogen is wasted. Further the use of ready mixed fertilisers does not teach the farmer anything of real value. He may find out that a certain mixture gives good or bad results, he can never know why. The use of one constituent fertilisers leads the farmer to study his manurial problems and to evolve a rational system of building up and maintaining soil fertility which the use of mixed fertilisers will not. In addition, fertiliser merchants are apparently not agreed on the question of the correct proportions in which the constituents should be present in mixtures. It is obviously impossible that they should be agreed, but this only tends to mislead the farmer who, in many cases ignorant of these matters, cannot see why the "potato fertilisers" offered for sale by "A" should be so different in composition from the "potato fertiliser" sold by "B." It is to be hoped that with the return to normal conditions, the proportion of one constituent fertilisers will return to what it was before the war.

Very few complaints from vendors have been received regarding the working of the Act. There have been one or two difficulties and the regulations have been subjected to a certain amount of criticism from a few parties. On the whole, however, there was very little dissatisfaction. Some difficulties were created by the sterilisation requirements in respect to bone products, but these were due to certain parties not taking the warning given by the passing of the Act in 1917, to see that these fertilisers were properly sterilised, so that in spite of the additional three months warning given by the publication of the regulations in August, 1918, they were left with mixtures containing unsterilised bone when the Act came into force on the 29th November.

Correspondence.—490 letters were sent out, of which 203 were reports on samples analysed or replies to queries of a technical character while 192 dealt with the Fertilisers Act.

Travelling.—An officer of the Division was in charge of the Departmental exhibit at the Agricultural shows held at Rosebank, Johannesburg, Pretoria and Maritzburg.

In November, 1918, I attended a conference of the chemists of the Department at Cape Town at which the Regulations framed under Act 21 of 1917 were discussed and revised, and uniform methods for the analysis of fertilisers and farm foods were drawn up.

Publications.—The following articles by officers of the Division were published during the year:—

1. "Fertilisers," by B. de C. Marchand. "The South African Journal of Industries," Vol. I. Nos. 10 to 16.
2. "The Determination of Phosphoric Oxide," by B. de C. Marchand. "South African Journal of Science," XV., 5, 357.

The following articles were prepared and submitted for publication:—

1. "Bat Guano," by B. J. Smit.
2. "The Soils of the Pretoria District," by B. de C. Marchand.
3. "The Composition of Some Feeding Stuffs," by B. de C. Marchand and B. J. Smit.

Buildings.—The matter of new buildings for the Division has been under consideration for some little time and during the latter part of 1918 a start was made by the architects of the Public Works Department with the preparation of plans, a suitable rough ground plan having been selected. It is hoped that by the end of the next financial year at latest, the Division will have moved into these more suitable quarters.

B. de C. MARCHAND,
Acting Chemist.

APPENDIX X*b*.

AGRICULTURAL RESEARCH CHEMIST.

The progress of work during the past twelve months has been considerably interfered with by reason of the great local scarcity of chemicals and apparatus, and the extreme delay in procuring these essentials from overseas. A large order for chemical apparatus has not yet at the time of writing (seventeen months after despatch) been executed.

The library of the institution has been arranged, classified and catalogued, and a large number of loose periodicals bound. It remains to be card-indexed when sufficient relaxation from more pressing duties permits. Many works of reference have been requisitioned for in order to render the library as up to date as possible, but the circumstances have been such that invariably many months, and, in some cases, years, have passed ere the books asked for have been supplied.

Laboratory No. 3 has now been equipped with an additional gas-fitted working bench and with electrical shafting for operating shaking appliances and suction pumps.

Mr. P. S. Malan, B.A., a graduate with first-class honours in chemistry, who occupied the position of chemical assistant in this laboratory, resigned after a year's service to enter upon a more lucrative post with a private manufacturing firm: his place here has since been filled by the appointment of Mr. W. J. Copenhagen, demonstrator in the Chemistry department of the University of Cape Town. Since Mr. Malan's departure other officers of my staff have also received attractive offers from private sources, and it will be very necessary to give the position of the chemical staff most careful consideration if that desirable factor in a laboratory's success—continuity of tenure on the part of its staff—is not to be permitted to suffer complete disintegration.

A considerable amount of time and priority has to be devoted to matters which cannot justifiably come under the category of research; for instance, the regular analysis of all consignments of Government guano and of Cape Cross phosphates imported by the Superintendent of the Government Guano Islands. Still less deserving of the name of research are the frequent consultations and requests for advice in regard to the use or to the registration of fertilisers, which emanate not only from different departmental officers, but also from merchants and agriculturists. Although such persons are invariably informed that I hold no official position under the Fertilisers Act, and are, as unvaryingly, directed into the right channels, yet, because there is no officer of the Department stationed in Cape Town to deal with such matters, the applicants repeatedly revert to me. Many of these matters are inherently small, but collectively the encroachment on one's time they make is considerable in view of the large amount of important work awaiting attention.

In my last annual report I stated that much of my time had been occupied in connection with the framing of regulations under the Fertilisers, Farm Foods, Seeds and Pest Remedies Act, No. 21 of 1917, and the drafting of uniform official methods for the analysis of fertilisers and farm foods in all the laboratories of the Department. At intervals throughout the whole of the year now under report these calls on my attention have continued. The task of drafting the methods was finally completed in November, 1918, when a conference of the chemists of the Department of Agriculture, presided over by myself, was held in Cape Town. A list of official methods was drafted for publication and certain amendments in the general regulations under the Act, and in the regulations and tariff for the chemical analysis of agricultural materials in general were recommended. It was also unanimously resolved to recommend the amendment of Act 21 of 1917, in such a manner as to make provision for controlling the sale of Kraal manure and Kraal manure ash.

The compilation of the methods of analysis above-mentioned marks a distinct epoch in at least one branch of chemical work in the Government laboratories of the Union, inasmuch as it is the first step forward in the direction of unification of purpose and methods that has ever been made. The official methods thus compiled are now being published and will naturally be adopted not only in the various Government laboratories, but by private analysts as well.

Further consideration has also been given, in collaboration with the Chief of the Division of Entomology, to the regulations for the sale of pest remedies under Act 21 of 1917, and a series of regulations for this purpose has been drafted.

Towards the close of last calendar year a new series of routine duties fell to my share consequent upon my appointment to standardise test bottles, pipettes, thermometers, etc., employed under the provisions of the Dairy Industry Act, No. 16 of 1918. I was also required to share in the drafting of regulations for the metrology of the glass apparatus just mentioned, but no actual standardisation was carried out during the period covered by this report.

Occasionally work has been done in my laboratory for other branches of the Department; for instance for the Entomologist, on whose behalf the capacity was investigated of shelled beans to retain hydrocyanic acid gas in poisonous proportion for different periods after fumigation; a series of experiments was also conducted to ascertain the best methods, quantities, and temperatures to adopt in the preparation of tobacco extracts for spraying by treatment of tobacco dust with water.

For the Forest Department a short investigation was made of the amount of oil of turpentine capable of being produced from Cluster pine trees, and a more extended enquiry was conducted into the proportion and character of eucalyptus oil yielded by two of the principal species of gum trees: in addition two series of soils—from Kraaifontein and from Bellville—were examined in order to elucidate, if possible, the cause of the dying of trees in the plantations.

The greater part of my time from April to September, 1918, was taken up in touring the Union as a member of the Departmental Committee on wheat growing, a subject on which it is unnecessary for me to make any remarks in the present connection. During that tour arrangements were made for the collection of about 200 samples of soil, representative of various soil conditions—particularly relating to wheat growing—throughout the greater part of the Cape Province, Orange Free State, and Natal. Many of these samples have now been received in my laboratory and are under investigation, although I regret to say that several are still outstanding in spite of repeated appeals to the farmers most concerned to forward them on. The money value of this series of analysis would be in the neighbourhood of £1,000, so it will be understood that with the small staff at my disposal they will take some time to complete. On the completed portion of this work however, I am preparing a special report which will form an appendix to the main report of the Wheat Growing Committee. The bulk of the work of this institution during the past year therefore falls into two sections (1) my tour of enquiry with the Wheat Committee, and (2) the resulting laboratory work on the soils of the places visited.

FERTILISERS.

To pass on, therefore, to other matters which occupied attention during the year, it may be said that enquiries were continued in regard to the possibilities of making up from local sources for the shortage of fertilisers usually imported into this country. As a matter of routine, attention had to be paid first of all to the articles which have been locally procurable in large quantities: I refer to the guano from the islands round the south-west coast, and to the phosphatic deposit from Cape Cross.

Government Guano.—Arrangements were made early in the present calendar year for samples of each consignment of Government guano arriving in Table Bay from the various islands to be analysed. These consignments are generally the mixed product of two or more islands. The following samples have thus been examined:—

I.—Bird and Ichaboe Islands. J.—Elephant Rock, Paternoster and Ichaboe Island.
K.—Paternoster, Lambert's Bay, Dyer's, Possession and Long Islands.

The percentage results obtained were as follows:—

	I.1.	I.2.	J.	K.
Moisture	14·39	9·23	13·80	16·68
Phosphoric Oxide—				
Total	17·42	14·20	11·08	12·35
Citric Acid soluble	14·94	11·32	10·87	11·83
Water soluble	1·49	3·90	3·49	3·65
Potash	1·36	1·95	1·88	1·80
Lime	16·12	14·88	11·06	12·64
Nitrogen	6·69	11·09	9·39	10·37

The composition of the first guano in the above list was so unusual that four additional determinations of total phosphoric oxide were made, and showed, respectively, 17·47, 17·67, 17·65 and 17·24 per cent. An additional determination of nitrogen gave the percentage 6·45. The composition of this sample, although unusual, is not absolutely unique, for in March, 1912, a sample was analysed having the following composition:—

Phosphoric Oxide—		
Total	15·42	per cent.
Citric soluble	12·72	,,
Water soluble	2·92	,,
Potash	1·73	,,
Lime	15·52	,,
Nitrogen	6·82	,,

There is a close resemblance between these two analyses: in both cases the figures for lime and phosphoric oxide are the highest ever obtained in Government guano, while the nitrogen percentages are in both cases, the lowest ever found. In both cases, moreover, there is a close correspondence between the proportions of lime and phosphoric oxide. This correspondence is usual in all samples of Government guano, and is due to definite combination between the phosphoric oxide and the lime in the form of calcium phosphate. In the guanos under discussion then it appears that the proportion of calcium phosphate has increased, while that of the nitrogen compounds has diminished, and they are therefore obviously not typical representatives of the guano procured from the islands. It appears to have undergone a partial change to the condition of phosphorite or guano phosphate.

It will be observed that a second sample (I. 2) taken from the same consignment contained less calcium phosphate but more nitrogen than the first.

Cape Cross Phosphates.—In my last report I recorded the results of analyses of the two consignments of phosphate received from the deposits at Cape Cross. During the year now under report several additional consignments arrived and were duly analysed. In addition to the above the scarcity of fertilisers owing to war conditions resulted in analyses being made of various other rocks supposed to be phosphatic as well as of some waste industrial products which, it was thought, might possess some fertilising value. These included phosphatic deposits at Kuruman, an occurrence of an iron-manganese phosphate at Kenhardt, a slightly phosphatic deposit at Bird Island, Algoa Bay, a few species of seaweed found growing on the shores of Table Bay, different classes of town refuse, wool-washery refuse, and waste from ground nuts, cacao beans and sugar factories.

Bone Meal.—A sample of an article sold to the Veterinary Department as *whale bone meal*, was analysed with the following results:—

Phosphoric Oxide	20·61	per cent.
Lime	29·44	,,
Nitrogen	3·86	,,

These percentages correspond more or less to the usual figures for *cattle* bone, but differ from those for whale bone. The latter article generally contains more phosphoric oxide and lime, but less nitrogen than the above figures show.

Limestone.—Amongst other articles examined from time to time in connection with the fertilising or improvement of the soil mention may be made of various calcareous deposits, particularly those reputed to be phosphatic. Two such samples were obtained from Lamberts Bay, one representing the formation at the surface and the other taken from a lower level. They gave the following percentages:—

	Surface.	Lower.
Lime	51·6	47·2
Phosphoric Oxide	·28	·22

These figures correspond to the following:—

	Surface.	Lower.
Calcium Carbonate	92·1	84·3
Calcium phosphate	·61	·48

The samples therefore, consisted mainly of calcium carbonate (agricultural lime) the proportions of phosphate being quite negligible. Another rock reported to be phosphatic, from the Darling district, contained only 1·18 per cent. of phosphoric oxide. This also, is too low to be of any fertilising value.

Two samples of limestone from Yzerfontein Point, in the Malmesbury Division, were analysed: one of these was white and gritty, and the other was of a light buff colour. The following percentage results were obtained:—

	White.	Buff.
Total Phosphoric Oxide	1.66	1·79
Carbon Dioxide	14·66	19·51
Equivalent to Calcium Carbonate	33·34	44·34

The carbon dioxide in these limestones was determined by heating the powdered rock, and calculating the amount of calcium carbonate from the loss on ignition. These rocks consist largely of impure calcium carbonate which, when crushed, forms what is usually called "agricultural lime". Small quantities of phosphate, it will be seen, were also present. A ton of the buff coloured rock would need to be supplied to an acre of soil in order to furnish it with about 35 lb. of phosphoric oxide, the quantity required for a single wheat crop, but not in a readily available form. The quantity of calcium carbonate (about 800 lb. per acre), thus given to the soil at the same time would doubtless be an excellent addition to the soils of the South Coastal Zuurveld, but the cost of transport would probably be out of proportion to the benefit conveyed.

A sample of calcareous formation from Saldanha Bay, was analysed with the following results:—

Carbon Dioxide	20·35	per cent.
Calcium Oxide—		
Direct determination	26·38	,,
Calculated from determination of Carbon Dioxide	25·84	,,
Phosphoric Oxide	1·29	,,

If the carbon dioxide as above be taken as the basis of calculation the sample contained 46·19 per cent. of calcium carbonate: if the direct determination of calcium oxide be taken the percentage of calcium carbonate was 47·11.

Analysis was also made of the agricultural lime from the Central Lime Works, Ltd., Ventersdorp, Transvaal, in view of a statement to the effect that on certain experimental plots treated with this lime lower returns had been given than on adjacent plots which had been totally unmanured. It was supposed that the proportion of magnesium carbonate in the limestone might possibly be so high as to account for this peculiar result. Analysis, however, showed both the absolute percentage of magnesia present, as well as its ratio to the percentage of lime to be altogether too low to be capable of causing any effects like those above-mentioned. The analytical results obtained were as follows:—

Lime	49·6	per cent.
Equivalent to Calcium Carbonate	88·6	,,
Magnesia	1·26	,,
Equivalent to Magnesium Carbonate	2·65	,,
Lime-Magnesia ratio	39·41	

Nitrates.—A parcel of crystals, which proved to consist of potassium nitrate, free from carbonate, chloride, sulphate and phosphate, was received from the Prieska district. The proportion of potassium nitrate was estimated (1) by heating with silica and ascertaining the amount of nitrogen pentoxide evolved, (2) by quantitatively determining the amount of potassium present. According to the first method (which cannot, however, be accepted as an absolutely accurate method, its results being usually somewhat too high) the percentage of nitrate (calculated as potassium nitrate) in the crystals was 92·3; according to the second method the crystals contained 90·7 per cent. of potassium nitrate.

Along with the crystals samples of earth and shale were received from the same locality. The shale contained white crystals visible to the unaided eye: these crystals, on being qualitatively tested, proved to be potassium nitrate. The earth, on heating, evolved nitrogen peroxide, indicating the presence of nitrates. The percentage of nitrates in the earth was then directly determined and found to be 0·56 per cent.

Soils.

Several soils from the South-West Protectorate and from the Divisions of Alexandria, Philipstown, Paarl, Cape and Malmesbury, have been analysed during the year, both chemically and mechanically. The results of these analyses will be printed and discussed in a separate publication.

Brak (Alkali) in Soils.—This subject is one that has been referred to by me on several previous occasions. During the twelve months under report, however, there has not been much opportunity of investigation in this direction, only one case of brak efflorescence having come under my attention. This was an occurrence on a farm in the Kraaifontein district, where the efflorescence forms on the surface of the soil in a "sloot" or eroded portion of the farm in spring or the early part of summer. It is said to stop crop growth and burn it up as soon as the soil water begins to dry up.

The percentage results of an analysis of this efflorescence were as follows:—

Moisture	4·49
Soluble in Acid	27·50
Soluble in Water	21·63
Sulphuric Oxide	1·41
Chlorine	9·50

Calculating from these figures the efflorescence would appear to be made up of the following salts:—

Sodium Sulphate	2·49	per cent.
,, Chloride	17·05	,,
,, Carbonate (by difference)	2·09	,,
	21·63	

The efflorescence, therefore, comprises mainly sodium chloride, and it is not at all to be wondered at that crops fail on a soil covered with a layer which contains one-fifth of its weight of sodium salts. As, however, only one-tenth of those salts consists of sodium carbonate the addition of gypsum will make practically no difference, but will leave the soil as barren as before. The only remedies in such a case are thorough under-drainage and mulching the surface of the soil.

Silt Deposit.—In view of the fact that the silt deposited by rivers when in flood is usually rich in the constituents of plant food a sample of silt from a dam near Brakpoort Station was analysed in order to ascertain whether that class of silt bore any resemblance to the silt deposited from flowing water. This point was of greater interest in view of the fact that the Brakpoort silt was reputed to impart a certain degree of fertility to soil with which it was incorporated. The results of the analysis were disappointing: they showed the silt to contain:—

Phosphoric Oxide	·22 per cent.
Lime	1·37 ,,
Total nitrogen	·077 ,,
Nitrogen as Nitrates	trace

The alleged fertilising action of this silt on the soil with which it was mixed was, therefore, plainly not of a chemical nature, but must have been almost entirely due to its physical condition: it had, probably, been mixed with a sandier soil to which it had imparted a better texture.

Plants and Plant Products.

Fodder Plants.—Analyses were made of samples of leaves and edible portions of the stems of the introduced Australian salt bush, *Atriplex semibaccata*, R.Br., which now grows wild in the Robertson Division. A report on this subject was, subsequently, issued as a laboratory publication.

Lichen Starch.—Some lichen, understood to grow in the district of Alexandria, C.P., was examined with the following percentage results in the air dry plant:—

Crude Vegetable Fat (Ether extract)	4·56
Starch	19·86

The ether, probably, extracted other substances in addition to the fat, and some, at least, of the "crude fat" may more properly be designated as a vegetable wax, for it contained phytosterol (by Salkowski's test), one of the aromatic alcohols which constitutes the base of some of the waxes.

The starch was determined by precipitation from the alkaline carbonate solution of the lichen by means of alcohol.

An analysis of lichen (Iceland moss) given by König ("Chemie der menschlichen Nahrungs und Genussmittel": 1889, vol. 1, p. 617) shows the following percentages:—

Crude Fat	1·41
Lichen Starch (lichenine)	55·65

The dried lichen known as Iceland moss (*Cetraria Islandica*) is a native of the north of Europe, and is used medicinally as a demulcent and slightly tonic article of food. In Iceland the lichen is freed from the bitter principle which it contains by washing it in cold water and sodium carbonate, and then either preparing jelly from it, or drying, grinding, and making it into bread. It is also made into jujubes, which are said to be useful for coughs. Squire's "Companion to the British Pharmacopoeia," 1899, describes the preparation of a decoction, a sugar, and a jelly prepared from Iceland moss, but whether these preparations are applicable to the articles found in Alexandria can be ascertained only by practical experiment.

The ether extract, as above observed, probably contains other substances as well as fat: for instance, cetraric acid, and lichenstearic acid are obtained from Iceland moss by extraction with petroleum spirit. The lichen starch is, like other starches, capable of conversion by weak hot acids into a fermentable sugar, and thence, by fermentation, into alcohol. Lichen starch can be prepared by heating lichen for several hours with a 2 per cent. solution of potassium carbonate and then precipitating by means of alcohol.

Wattle Bark.—An average sample of bark of *Acacia decurrens*, grown in the Paarl Division, was examined for its tannin content, which was found to be 16·31 per cent. As there are several ways of determining tannin in use it may be said that the determination in this case was conducted according to the method used in Leeds University Laboratory (see H. R. Procter, "Leather Industries Laboratory Book" (1908), pp. 227-228). The percentage results arrived at were as follows:—

Total Oxidisable material	22·64
Calculated as Oxalic Acid	37·79
Tannins	16·31
Calculated as Oxalic Acid	27·22

In the case of some Wattle trees (*Acacia mollissima*) in the Lydenburg District, Transvaal, which had died after an attack of gumming, the bark, which had begun to peel off, was stripped and examined for the purpose of ascertaining whether it contained any serviceable quantity of tannin. The following results were obtained:—

Total Oxidisable Material	14·44
Calculated as Oxalic	23·13
Tannins	12·64
Calculated as Oxalic Acid	20·24

These figures are rather lower than those yielded by the bark from living healthy trees, but they are higher than those from such articles as oak bark for example.

Resin Tapping Experiments.—The Cluster Pine trees in the Uitvlugt Plantation, under the control of the Forest Department, were first tapped for resin about two years ago: during the earlier half of 1918 they were tapped for the second time, the trees being then from 28 to 34 years old. A quantity of the crude resin thus obtained was examined in the laboratory with a view to determine the percentage of turpentine and colophonium. The yield of oil of turpentine obtained from this resin by steam distillation amounted to 16·90 per cent. by weight. The percentage of common resin or colophony, regarding the latter as the fixed residue left after distillation of the oil of turpentine from the crude turpentine or eleo-resin, would thus amount to 83·10 per cent.

According to Allen (" Commercial Organic Analysis," 1907, vol. 2, pt. 3, p. 157), the lightest coloured resin is obtained from trees on their first tapping, and it then constitutes about 80 per cent. of the oleo-resin. In subsequent years the proportion of resin in the crude turpentine gradually increases and the resin from any given trees also becomes darker year by year.

Eucalyptus Oil.—A number of samples of eucalyptus oils have been examined during the year, most of these having been prepared in the laboratory from leaves supplied by the Forest Department. Amongst the questions on which information was sought was the quality of South African Eucalyptus Oil compared with Australian, the difference in physical constants between the oils produced by different species of eucalyptus such as *E. globulus* and *E. amygdalina*, and the comparative yields of oil obtainable from young and mature leaves and from fresh and dry leaves respectively. The detailed investigations need not be given here as they are being published elsewhere.

INSECTS, ECONOMIC AND NOXIOUS.

Arsenical Poisoning of Bees.—Owing to the discovery of several hundreds of dead bees near the experimental hives at Rosebank, about 600 of the insects were tested for the presence of poisons. In a parcel of 50 bees arsenic was found to be present to the extent of ·001 per cent. In the case of a human being of, say, 150 lb. weight, 2 grains of arsenic would be a dangerous dose, that is to say about ·0002 per cent., or one-fifth the proportion found in the bees. A larger lot of bees was then similarly tested and found to contain ·0225 of a milligram of arsenic. There seemed to be no doubt that this substance had caused the death of the bees.

Blistering Beetles.—Some specimens of *Mylabris* and *Cyaneolytta*, South African beetles analogous to the " Spanish fly " and like the latter containing the active principle cantharidin, have been examined. The results of the analyses have been embodied in a paper communicated to the *South African Journal of Industries* and need not, therefore, be further referred to in the present report.

Destruction of Insect Pests.—In connection with the use of hydrocyanic acid gas for the destruction of weevils in beans at the Cape Town Docks it became necessary to ascertain whether any residual risk to consumers of the beans remained after an apparently reasonable time for dissipation of the poisonous gas had elapsed. Some of the beans had holes in them, whilst other had cavities, still covered over with a thin layer of the seed coat, from which the weevils had not yet emerged. The points regarding which there was uncertainty were the following: in the case of the open cavity the hydrocyanic acid gas would have free access to the substance of the bean itself, and even where the seed coat still covered the cavity perforations round its edge may afford such access. Even where the seed coat was sound there was a possibility of such penetration, the gas being absorbed and retained by the moisture which forms a constituent part of the bean. Experiment showed that the beans continued to exhale hydrocyanic acid for several weeks after the fumigation: they would be left exposed until odourless and then left in a closely stoppered bottle for some weeks, and on opening the bottle at the expiration of that time the odour of hydrocyanic acid would be quite perceptible again.

Nearly five months after the fumigation boiling of the beans in water rendered the latter faintly acid, both to litmus and to phenolphthalein, and on distilling some of the beans with water, hydrocyanic acid was obtained corresponding in amount to ·002 per cent. of the original sample of beans. The point that was not determined was whether the cyanide was present only in the beans whose seed coat had been injured by the insects or whether it was also retained in those which had a perfect seed coat; nor was any boiling test conducted in order to ascertain whether ordinary cooking would drive off sufficient of the cyanide to leave the cooked beans perfectly safe as human food. As potassium cyanide decomposes on boiling with water it is most probable that cooking, if sufficiently prolonged, would minimise any pre-existent risk.

According to the dictum of Taylor, generally accepted by toxicologists, 65 milligrams of anhydrous hydrocyanic acid would under ordinary circumstances suffice to destroy life. On this basis 7½ lb. (3,250 grams) of beans containing ·002 per cent. of hydrocyanic acid would be needed to produce a fatal result, and as 100 of the fumigated beans weighed 62·87 grams, at least 5,170 would have had to be eaten to cause death.

Sulphur.—Very finely divided sulphur when exposed to the air, tends to oxidise with the formation of sulphur acids. Such sulphur is inclined to be lumpy and to spread with difficulty when blown out of a sulphuring bellows. The matter was referred to in my article on "Sulphur as a Pest Remedy" in the *Cape Agricultural Journal*, of December, 1908. Some sulphur imported from Japan last August, was described by some as "distinctly acrid to the taste like powdered alum," and by others as "salty." A sample of this sulphur however left, on ignition at a low temperature, only ·048 per cent. of ash, thus disposing absolutely of the idea that it contained an admixture of salt or of any other metallic compound. The sulphur however had a distinctly acid taste, which was found to be due to the presence of ·60 per cent. of free sulphuric acid, together with very minute traces of sulphurous acid.

Tobacco Water for Spraying.—The increase in cost of tobacco extract has made the use of the latter for the spraying of fruit trees against insect pests almost prohibitive, and endeavours were therefore made, at the suggestion of the Cape Province Entomologist, to ascertain the possibilities of preparing a uniform quality of tobacco water. It is intended to publish the results of these investigations as soon as they are sufficiently advanced for the purpose.

SPECIAL REPORTS AND PAPERS.

Technical Reports.—As usual I have been called upon at intervals during the year to furnish reports upon a variety of subjects. The nature of these reports may be gathered from the following list of heads, the reference numbers of each being quoted:—

Preparation of Starch from Mealies	P. 451/410
Unit Values for Fertilisers	P. 350/434
Fish refuse for Fertiliser Manufacture	P. 350/540
Nightsoil for Fertiliser purposes	P. 350/590
South African Mylabrids as a source of Cantharidin	P. 382/683
Transportation of Liquid Manure	P. 350/691
Elands boontje (*Elephantorrhiza Burchellii*)	P. 490/692

Publications.—The following papers bearing on scientific or technical subjects have been published during the year:—

"Australian Salt bushes": *Farmer's Weekly*, Vol. 15, No. 383, pp. 2064, 2065.
"Maize oil": *Farmer's Weekly*, Vol. 16, No. 403, p. 1367.
"Tannery waste products": *Farmer's Weekly*, Vol. 16, No. 404, p. 1487.
"The grasses of the Eastern Coast Belt available for the manufacture of paper; and the possibilities and prospects of paper-making in the Union of South Africa": *Industries Bulletin Series* (Department of Mines and Industries), Bulletin No. 7.
"Agricultural Soil Surveys": *Farmer's Weekly*, Vol. 16, No. 409, p. 2011.

CHAS. F. JURITZ,
Agricultural Research Chemist.

APPENDIX XI.

THE LIBRARY.

My report for the year would not be complete without re-emphsising the necessity of providing more literature for research work. As stated in previous reports, £5,000 is urgently needed to purchase sets of scientific periodicals and standard works of reference, the lack of which is most seriously felt in practically every research undertaken by officers of the Department.

During the period under review, 785 volumes were received and 68 were bound.

The number of completed bound volumes now in the Library is 8,080. The Bulletins, Leaflets, etc., contained in the Library total about 13,700, and approximately 13,080 works are deposited with the Divisional and School Libraries which includes 490 volumes bound during the year and the Galpin Botanical Library acquired from Mr. Galpin at the very reasonable sum of £500 which is housed in the office of the Chief, Division of Botany, Pretoria. As in previous years, all the binding was done free of charge by the Prisons Department, the cost of the materials being borne by the Government Printer.

The number of Journals, Reports, Annuals, Bulletins, etc., subscribed to, exchanged or received gratis during the year was 1,810, against 1,719 received the year before.

3,910 people visited the Library, while the year before the number was 4,094, the small decrease being due to the influenza epidemic. The correspondence amounted to 6,690 letters and advices sent out and 6,350 received as against the previous year's correspondence of 4,037 letters out and 3,780 letters in. The very great increase was mainly caused by the larger number of applications received for Departmental Bulletins, etc., and but for the influenza epidemic, the figures would have been still higher.

The scheme for lending books to farmers was continued and the deposits on hand on 31.3.19 amounted to £235 12s. 2d. The number of readers in each Province was as follows:—Cape, 64; Natal, 32; Orange Free State, 27; Transvaal, 106; Swaziland, 1; S.W.A. Protectorate, 2; Basutoland, 1.

The staff of the Library consisted of the Librarian, two lady clerks, one of whom is engaged on the work connected with publications issued by the Department, and a messenger.

EXPENDITURE ON BOOKS DURING 1918-19.

(1) *For the Department:—*

	Complete Works.			Periodicals.			Total.		
	£	s.	d.	£	s.	d.	£	s.	d.
Library	250	4	2	111	8	2	361	12	4
Division of Veterinary Research	17	13	11	72	11	0	90	4	11
Division of Botany	505	8	7	23	4	4	528	12	11
Division of Entomology	1	1	11	10	15	2	11	17	1
Veterinary Division	2	4	0	40	1	4	42	5	4
Division of Chemistry	35	4	6	12	12	6	47	17	0
Division of Dairying	—			5	12	9	5	12	9
Division of Viticulture	3	9	5	8	15	0	12	4	5
Various other Offices	0	3	0	13	10	1	13	13	1
Total	815	9	6	298	10	4	1,113	19	10

(2) *For the Agricultural Schools:—*

	Complete Works.			Periodicals.			Total.		
	£	s.	d.	£	s.	d.	£	s.	d.
Glen	71	7	9	23	15	0	95	2	9
Cedara	78	11	2	47	12	7	126	3	9
Potchefstroom	83	11	1	46	18	8	130	9	9
Grootfontein	85	2	8	42	0	9	127	3	5
Elsenburg	60	6	9	51	1	0	111	7	9
Total	378	19	5	211	8	0	590	7	5

AGRICULTURAL PUBLICATIONS ISSUED BY THE DEPARTMENT.

These publications are divided in 5 classes, *i.e.*, Annual Reports, General Series, Science Bulletins, and Press Circulars.

Some 970 copies of the Annual Reports are distributed to foreign exchanges and Institutions from whom similar publications are received, by the Department and Institutions and Foreign Governments who specially asked for them. Members of Parliament, the Provincial Council and Farmers' Associations:—

The General Series are circulated as follows:—

Members of Parliament, Senators, Members of the Provincial Council	135
Officers of the Department of Agriculture	135
Members of the Provincial Council, English	248
Dutch	68
Magistrates and Justices of the Peace	247
Consuls in the Union	42
Public Institutions, etc. (Chambers of Commerce and Educational Bodies)	120
Private persons of note in the Union (including Heads of Government Departments)	20
Foreign Exchanges	760
Libraries in the Union	277
Newspapers in the Union	177
Agricultural Societies and Farmers' Associations, etc.	308
Total	2,402

The publications belonging to the Local Series are only issued to addresses within the Union of the above list.

The Science Bulletins are distributed to officers of the Department of Agriculture, Members of Parliament, Libraries in the Union and Foreign Exchanges.

The Press Circulars are issued to the Newspapers and to the Agricultural Societies and Farmers' Associations in the Union.

In addition to the distribution indicated above, 3,171 applications for Agricultural Bulletins were received from private individuals, in compliance with which requests some 44,026 Bulletins on various subjects were sent.

With a view to preventing wastage on the Bulletins, a small charge was placed on some of the more important ones, the proceeds of the sales amounting to £17 18s. 9d. for the period of 1.10.18 to 31.3.19.

A list of 89 publications written by Officers of the Department is annexed.

1918.

No. 1. A Report of the work at the field station for the study of the black wattle, by C. B. Hardenburg, M.A., Division of Entomology, Officer in Charge of Wattle Insect Investigation.

Annual Report of the Department of Agriculture, 1917-18.

Annual Report on Agricultural Education, 1917-18.

Numbered Bulletins, General Series, 1.4.18-31.3.19.

No. 2. Seed Selection of Turkish Tobacco, by P. Koch, Officer-in-Charge, Elsenburg Tobacco Station, Western Province and Government Tobacco and Cotton Expert for the Eastern Province.

No. 3. The characteristics of Citrus Canker and its eradication, by Dr. E. M. Doidge, M.A., D.Sc., F.L.S., Mycologist, Union Department of Agriculture.

No. 4. Root diseases in Cane and suggestions for its control, by Dr. P. A. v. d. Bijl, M.A., D.Sc., F.L.S.

No. 5. Agricultural grasses, by H. A. Melle, Officer-in-Charge, Botanical Experiment Station, Groenkloof, Pretoria.

No. 6 & 7. Breeding Experiments with North African and South African Ostriches, Parts III and IV, by Prof. J. E. Duerden, M.Sc., Ph.D., Officer-in-Charge, Ostrich Investigations, Grootfontein School of Agriculture, Middelburg, C.P.

No. 8. Third Report on Cattle Feeding Experiments, conducted at the Schools of Agriculture and Experiment Farms at Cedara, Natal and Potchefstroom, Transvaal.

No. 9. The Bagrada Bug, by D. Gunn, Entomologist, Division of Entomology.

No. 10. European Foul Brood, by C. P. Lounsbury, Chief, Division of Entomology.

No. 11. The Grape Vine Sphinx Moth, by D. Gunn, Entomologist, Division of Entomology.

No. 12. Pea and Bean Weevil, by S. Skaife, B.A. (Hons.), Assistant Entomologist, Division of Entomology.

No. 13. Winter Cereal Experiments at the School of Agriculture and Experiment Farm, Potchefstroom, 1915, '16 and '17.

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1919.

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No. 66. Model Regulations for Co-operative Cattle and Dairy Societies, by J. Retief, Registrar of Co-operative Agricultural Societies.

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No. 77. Milk Records, by J. Lyons, A.R.C.S. (Formerly Lecturer in Dairying, Grootfontein School of Agriculture.)

No. 78. Common Fungous and Bacterial Diseases of Plants, by Dr. E. M. Doidge, M.A., D.Sc., F.L.S.

No. 79. Farmyard Manures, by T. D. Hall, B.A., M.Sc., Agric. Lecturer in Chemistry, Potchefstroom School of Agriculture.

No. 80. The Sulphur Requirements of Crops, by A. Stead, B.Sc., F.C.S., Lecturer in Chemistry, Grootfontein School of Agriculture.

(*d*) *Science Bulletins.*

No. 10. A Cane Leaf Spot, by Dr. P. A. v. d. Bijl, M.A., D.Sc., F.L.S.

(*e*) *Unnumbered Publications.*

Citrus growing in South Africa, by R. A. Davis, Chief, Division of Horticulture, Monthly Crop Reports No. 10, 1918-1919, and Press Circulars.

(*f*) *Old Publications Re-printed.*

1912.

No. 27. Home Remedies for Live-Stock, by T. H. Dale, M.R.C.V.S., Government Veterinary Officer, Potchefstroom.

No. 37. Egg Production, by A. Little, Lecturer on Poultry Keeping, School of Agriculture, Grootfontein, Middelburg, C.P.

No. 40. Common Household Remedies for Poultry, by A. Little, Lecturer on Poultry Keeping, School of Agriculture, Grootfontein, Middelburg, C.P.

1915.

No. 81. Manuring of Land, by T. G. Reinecke, B.A., Lecturer in Chemistry, School of Agriculture, Potchefstroom.

1916.

No. 1. Raisin making in South Africa, by I. Tribolet, Lecturer in Horticulture, Elsenburg, School of Agriculture, Mulder's Vlei.

No. 2. The Quince Borer and its Control, by T. W. Pettey, B.A., Entomologist, Elsenburg, School of Agriculture.

No. 4. The Potato Tuber Moth, by W. T. Schlupp, B.Sc., (Agric.) Entomologist, School of Agriculture, Potchefstroom.

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No. 2. Design for Cattle Crush and Stock Sheds, by W. S. H. Cleghorne, B.Sc., A.M.I.Mech.E., Lecturer in Engineering, School of Agriculture, Potchefstroom.

PAUL RIBBINK,

Librarian.

APPENDIX XII.

DIVISION OF CO-OPERATION.

THE NUMBER OF ACTIVE SOCIETIES

is thirty-one, of which nine have been registered during the period under review. The nature of the business conducted by them, and the Province in which they are operating, are shown in the following:—

Transvaal: Produce and Implements, 14; Threshing, 1; Tobacco, 1; total, 16.

Orange Free State: Produce and Implements, 4; Cheese Factory, 3; Cattle and Dairy, 8; total, 15.

REMOVAL OF SOCIETIES FROM REGISTER.

During the year one society was removed from the Register of Co-operative Agricultural Societies, namely, the Paul Roux Koöperatieve Zuivel Vereniging. The main object of the society was to supply members with dairy livestock. During the influenza epidemic the number of the members was, through deaths, reduced below that required by the Co-operative Act, and dissolution followed in terms of section 24 (4) of the said Act. The loan granted by the Land Bank to this society was £3,000, of which £57 19s. 10d. is still owing to the Bank. It is expected that this small balance will also be repaid shortly.

PROGRESS MADE BY SOCIETIES.

Maize Societies.—The information given under the heading "Position of Individual Societies" shows that, with a few exceptions, the working operations of the maize societies during the year have resulted in a profit amounting, in some cases, to considerable sums. It is, however, necessary to point out that the actual progress made by a society during the year cannot be measured by the profits shown. The produce societies established under the Co-operative Acts pay the members the full price realised on their produce, less a certain commission to cover the administration charges for the year, including interest on instalment loans, depreciation, etc. Should this commission exceed the administration charges, such surplus is declared the profit for the year. The regulations of nearly all the societies provide that these profits shall be placed to the General Reserve Fund (which does not include reserve for bad debts), and the amount so added to that fund during the past year is £14,712. The total of this General Reserve Fund now stands at £81,257. It will therefore be seen that, from a financial point of view, the societies have on the whole, materially strengthened their positions, and it is, for obvious reasons, necessary that they should do so. But the principal aim of a produce society is not to make large profits: the real object is to obtain for the members the highest possible price for their produce, and it is only in proportion to the degree of success attained in that direction that such organisations may be expected to exert a stimulating influence upon the development of the agricultural industry. In this their main object the maize societies have also attained a fair measure of success.

In my last report I again dealt fully with the position created in some societies through the rather large amounts outstanding amongst members in respect of farming requisites bought. There are to-day still a few societies which are rather severely handicapped in their operations through outstanding debts, but there is a continuous improvement in this respect, and with the increased attention now being paid to this matter, it may confidently be anticipated that this part of the societies' business will ultimately be conducted on sound lines. Furthermore, some of these societies have decided to adopt a strictly cash system in future, which is of course, a very healthy sign. It affords me great pleasure to be able to state that the societies formed during the last four years have without exception, followed my advice to insert, right from the commencement, a clause in their regulations providing for all transactions to be for cash only. By adopting the cash system, these societies are not only eliminating many grave dangers in the conduct of their business, but they also gain the further advantage of being able to supply their members with farming requisites at cheaper rates than would otherwise have been the case.

While the members of the co-operative maize societies have greatly benefited in the past, especially during the years 1917 and 1918, through the collective purchase of grain bags in India—in 1918 the total saving effected was £20,000—the purchases so made during the past year for the coming maize season have become a matter about which the societies are greatly concerned. In consequence of the prospects of the early cessation of hostilities in Europe having been regarded as remote during August, 1918, the prevailing opinion both in South Africa and Calcutta at the time was that the difficulties attending the securing of cargo space on the vessels plying between India and South Africa would be materially enhanced, and that any dilatoriness on the part of buyers of gunnies and kindred Indian manufactures would fail to secure freight for their purchases unless they entered the market at an unusually early date. The general concurrence in that opinion on the part of all shippers influenced the societies to adopt the policy which was at that time generally pursued, and the order for their requirements for the 1919—20 season was placed even before the commencement of planting operations. About two months later hostilities in Europe suddenly ceased, and a sudden drop in the Indian Jute market occurred, which was reflected in a real panic in the South African gunny market. Weak holders of gunnies apparently determined to get rid of their bags at all costs, and the liquidation of one or two big buyers accentuated the drop in prices. The ultimate result of the combined operation of such factors was to depress the local value of grain bags considerably below Calcutta parity, for even to-day it is impossible to land 2½ lb. grain bags ex. Calcutta at less than 1s. 3d., whereas they are being offered fairly freely at 1s. 1d. at Durban. That societies would fail to dispose of the bags purchased by them if they insisted upon distributing them amongst members at cost price was from the outset obvious, and they accordingly decided, with few exceptions, to dispose of the bags at current market values—a decision on their part which it is superfluous to observe will occasion them heavy losses during the coming year.

A further stage having been reached in the erection of Elevators by the appointment of a consulting engineer with special experience of elevator construction to decide details of design, site, etc., it may confidently be expected that some of the chief difficulties which the maize societies had hitherto to contend with will soon disappear, namely, the storage and grading of maize and the rather heavy expenditure in connection therewith.

Tobacco Societies.—The Magaliesberg Tobacco Society has had another successful year. The prices realised on behalf of the members for the different grades of tobacco delivered by them were even higher than those obtained during the previous year, while the society was, at the same time, in a position to add a further £3,293 14s. 10d. to its reserve fund, which now stands at £21,856 17s. 8d.

This society affords a good illustration of the advantages to be derived from agricultural co-operation when its guiding principles are carefully observed.

South African tobacco has, to a certain extent, been made familiar and popular in England by the South African troops during the war, but to maintain its hold among smokers standardisation and systematic marketing arrangements will be needed. Realising this, and being desirous not to allow such a favourable opportunity of establishing an oversea market for the South African product to escape, the Magaliesberg Tobacco Society has despatched one of its directors, and the secretary to England, with the object of gaining information regarding the best method of placing their tobacco on the British and other markets.

Threshing Societies.—While some of the maize societies are carrying on threshing operations in addition to other business, and with very good results, only one society has so far been formed which is exclusively engaged in these operations, namely, the Olifantsrivier Coöperatieve Dorschwerk. This society has so far had a fair amount of success: it has enabled its members to thresh their produce at rates considerably below the ordinary and has, at the same time, accumulated a reserve fund amounting to £1,466. But even better results would have been obtained if it carried on its business in a more business-like manner by insisting upon cash payment of the threshing fees, instead of allowing, as is being done, credit for these payments, extending to a year and more, whereby bad debts naturally occur.

Cheese Societies.—Owing to the altered conditions prevailing in respect of the cheese market, these societies have not been in a position to pay such good prices to their members for their cheese as in the previous year. The Excelsior Co-operative Cheese Society has had to contend with many difficulties, chiefly in securing the services of a good cheese-maker, and the result of the year's operations has consequently not made a too favourable impression upon the members.

Cattle and Dairy Societies.—With one exception—Kopjes—these societies are as yet only engaged in supplying thoroughbred bulls and cows of good milk-producing breeds to the members. A further important object contained in the regulations is the distribution of milk in manufactured form or otherwise. As soon as a sufficient supply of milk can be commanded and other conditions warrant it, some of these societies will, no doubt, later on, carry out this object also, in the same way as the Kopjes society is doing at present. The membership of a society of this description is usually small, and where the distribution of milk is not yet undertaken, the administration work can usually be performed by the members themselves. But the very fact that the administration of these societies is so simple is responsible, in some cases, for a tendency to ignore the provisions of the regulations. This necessitates very close supervision on the part of this Division which it has sometimes not been found possible to exercise owing to an insufficient staff of inspectors. Apart from this, these societies have already been of great benefit to their members which will, no doubt, ultimately be reflected by their larger influence upon the dairy industry of the country.

Cotton Societies.—The Rustenburg Co-operative Farmers' Society has for some years past, been undertaking the handling and selling of members' cotton on co-operative lines, and although the society was confronted with many difficulties in this branch of its business in the beginning, it is now making good progress, and its cotton-producing members are deriving great benefit from the society in this connection. The society is still in want of a plant to extract the oil from the seed, and hitherto it had to be content with grinding the seed and selling this by-product as cattle food. Great efforts are being made to acquire the necessary plant, and when these prove successful a big step forward will have been gained as it will still further stimulate cotton-growing amongst the members.

EXTENSION OF MOVEMENT.

During the period under review ten new societies were registered, nine of which are already carrying on active operations, viz.: Hobhouse Koöperatieve Zuivel Vereniging, Koolspruit Koöperatieve Vee en Zuivel Vereniging, Lindley Boeren Koöperatieve Vereniging, Lindley Koöperatieve Vee en Zuivel Vereniging, Manitoba Koöperatieve Zuivel Vereniging, Senekal Koöperatieve Landbouw Vereniging, Unie Koöperatieve Vee en Zuivel Vereniging, Valsch River Co-operative Cattle and Dairy Society, and Aasvogelkrans Koöperatieve Vereniging.

Of these, two devote themselves to the sale of members' produce, and the collective supply of farming requisites; one is engaged in the manufacture of cheese and the collective supply of dairy requisites to members; and the remaining six supply their members with dairy cattle.

At the time of writing three further new societies (maize) have been established, two of which are already actively engaged in the transaction of business. This brings the total number of active societies at the present moment to 33, as compared with 17 three years ago.

Good progress has been made with the establishment of maize societies in the principal maize districts of the Orange Free State, and there is every indication that very many more of these societies will be formed in that Province in the near future.

This also applies to the co-operative cattle and dairy societies, in the formation of which a keen interest has been evinced.

My advice to these co-operators from the commencement of this movement has been to limit the membership of the society to a certain number in sparsely populated areas. By this means a better mutual understanding and closer co-operation amongst the members are brought about and administration expenses are practically eliminated, as the members are able by mutual agreement to perform the little administration work connected with the society themselves.

The regulations of these societies generally provide that the value of the livestock to be supplied to any one member shall be limited to £300, while the particular breed with which the members may be supplied is also stipulated in the rules. Further important provisions are that no cattle shall be supplied to any member unless the Board is convinced that he is in a position properly to care therefor, and to safeguard members in regard to losses which may result in respect of their joint and several liability, the ownership of the livestock remains vested in the society until paid for.

From correspondence received by me from time to time from farmers in different parts of the country who are desirous of forming societies of this kind, it would appear that, in many instances, these societies are looked upon as a simple method of acquiring ordinary livestock. To remove this false impression the fullest possible explanation of the objects of the society is usually given by me, while proper care is also exercised to avoid any misunderstanding when the time arrives for the registration of the society.

The question of co-operation in wool is receiving more and more attention on the part of wool growers throughout the country, and although no societies have yet been formed to deal exclusively with wool, the majority of the grain societies are beginning to show a keen desire no longer to treat wool merely as a side-line, but to introduce better methods in the disposal of members' wool, and to arrange for expert advice as to shearing, sorting, classifying and baling, to be placed at the disposal of the members.

A further important step in this connection is the decision of the Central Agency for Co-operative Societies, Ltd., to establish a depôt at Durban for the purpose of dealing with the wool of affiliated societies. Representatives of the Agency have already visited Durban to secure the necessary site, and it is expected that the depôt will be completed before the commencement of the next wool season.

A good deal of my time has been devoted to propaganda work during the year. We are as yet only on the threshold of the co-operative movement, and much remains to be done. There are indications of a lively interest in co-operation being taken by farmers throughout the country, and although for some years no societies were registered under the co-operative laws of the Transvaal and Free State, the number of active societies, as stated elsewhere in this report, is at present 33, as compared with 17 three years ago. This increase could easily have been greater if it had been only a question of registering as many societies as possible, and it would not be correct to gauge the extension of the movement only by the number of societies registered. The important point, especially at this stage, is to have societies which are answering to the purpose for which they were established, and which are in a position to afford the members the advantages that they expected from their organisation at the time of its establishment. A single society of this kind, by its good example, does more towards extending the cause than a dozen others which have to struggle along for an existence, while a society which fails altogether does infinite harm to the movement. The causes of such failure are not ascribed by the general public to bad management or something similar, as in the case of an ordinary business, but all the blame is cast on co-operation itself, with the result that the failure of any society tends to bring the whole movement into discredit and to handicap further extension. The lesson to be learned from this is to see that only societies are registered whose business prospects are such as to indicate that they will probably be able successfully to carry out their objects, and that when registered, their business is properly conducted. As regards the first point the policy adopted by me is not to register any society which has not a reasonable prospect of attaining success, but as regards the second point, the small staff at present at my disposal does not permit of exercising that supervision over the societies which is necessary, and the lack of which may easily have very detrimental effects on the whole movement.

INSPECTION OF CO-OPERATIVE SOCIETIES.

The necessity for a comprehensive and detailed system of inspection and audit in connection with the societies is generally recognised, and there can be little doubt that but for the inspections conducted by this Division—which comprise very much more than ordinary audit of the books and affairs of the societies—the co-operative movement would have been shortlived.

During the year under review my staff of inspectors, which had already become inadequate by reason of the rapid extension of the movement in the Orange Free State, was reduced by two, one having resigned in May, owing chiefly to the small salary paid to him, and another having left the Division in November. At the time of writing still another of the inspectors has resigned in order to take up a secretarsyhip with one of the societies, which leaves me with one inspector and a learner appointed a few months ago, whereas I consider there should be at least five fully qualified inspectors to cope with the work satisfactorily.

I cannot too strongly emphasize the necessity for the immediate provision of a sufficient staff of inspectors. It would be useless to continue establishing new societies unless a proper watch can be kept over them, and if more attention is not given to the existing societies than has been possible during the past year, it will not be surprising to find some of them getting into serious difficulties. The work should either be done thoroughly or not at all; half-measures are dangerous. The Directors of the societies are relying upon regular inspections being conducted by this Division, and unless a sufficient staff of inspectors can be appointed immediately at salaries commensurate with the work to be performed, they should, in my opinion, at least be made acquainted with the fact in order that they may take steps to safeguard their interests.

TURNOVER OF SOCIETIES.

	1917.	1918.
Produce :		
Mealies sold	516,652 bags.	784,615 bags.
Tobacco sold	2,356,901 lbs.	1,534,621 lbs.
Cheese sold	51,979 lbs.	141,602 lbs.
Value of other produce sold	£129,078	£142,536
Farming Requisites :		
Value of machinery, etc., sold to members	£186,018	£172,356
Cattle supplied to members	—	£16,473

As will observed, there is an increase of over 200,000 in the number of bags of mealies disposed of by the societies during 1918, as compared with 1917. The sales of other produce also compare favourably with those of 1917, with the exception of tobacco, in regard to which it should be explained that the tobacco received by the society from its members during 1918 was about 1,000,000 lbs. more than during 1917, but during the last few months of 1918 hardly any deliveries were made to buyers as the result of the influenza epidemic. The decrease in value of machinery, etc., sold, as compared with the previous year, is chiefly due to the continued restrictions placed on credit sales.

MEMBERSHIP OF SOCIETIES.

The following is a list of the societies in active operation, showing particulars of the changes which have taken place in their membership during the period 1st April, 1918, to 31st March, 1919:

Society.	Additions.	Withdrawals.			Total Withdrawals.	Total Membership.
		Resignations.	Deaths.	Expulsions.		
1. Aasvogelkrans Koöperatieve Vereniging	7	—	—	—	—	7
2. Centraal Westelijke Coöperatieve Landbouw Vereniging	88	26	2	106	134	502
3. Ermelo Coöperatieve Vereeniging	10	18	3	—	21	183
4. Excelsior Koöperatieve Zuivel Vereniging	35	1	1	—	2	54
5. Frankfort Koöperatieve Landbouw Vereniging ..	78	18	4	—	22	199
6. Heidelberg Coöperatieve Landbouw Vereeniging ..	14	50	—	—	50	223
7. Hobhouse Koöperatieve Zuivel Vereniging ..	46	—	—	—	—	46
8. Hoogeveld-Eendracht Boeren Koöperatieve Vereniging	30	39	—	—	39	474
9. De Kestell Koöperatieve Zuivel Vereniging ..	14	3	—	—	3	97
10. Kestell Koöperatieve Vee en Zuivel Vereniging ..	1	1	—	—	1	10
11. Koolspruit Koöperatieve Vee en Zuivel Vereniging	7	—	—	—	—	7
12. Kopjes Koöperatieve Zuivel Vereniging	2	—	—	2	2	20
13. Koster Coöperatieve Landbouw Vereeniging ..	26	71	6	—	77	507
14. Lichtenburg Koöperatieve Landbouw Vereniging ..	62	83	2	—	85	1,298
15. Lindley Boeren Koöperatieve Vereniging	140	—	5	—	5	135
16. Lindley Koöperatieve Vee en Zuivel Vereniging ..	9	—	—	—	—	9
17. Lijdenburg Koöperatieve Landbouw Vereniging ..	39	8	3	—	11	345
18. Magaliesberg Koöperatieve Tabakplanters Vereniging	238	125	15	—	140	2,288
19. Manitoba Koöperatieve Zuivel Vereniging	7	—	—	—	—	7
20. Marico Boeren Koöperatieve Vereniging	—	20	1	—	21	172
21. Middelburg Landbouwers Coöperatieve Vereeniging	63	52	15	—	67	657
22. Olifantsrivier Coöperatieve Dorschwerk	1	2	6	—	8	181
23. Pretoria Landbouw Koöperatieve Vereniging ..	—	1	—	3	4	45
24. Rustenburg Boeren Koöperatieve Vereniging ..	14	95	—	—	95	641
25. Senekal Koöperatieve Landbouw Vereniging ..	180	—	6	—	6	174
26. Standerton Coöperatieve Boeren Vereeniging ..	4	50	—	—	50	456
27. Unie Koöperatieve Vee en Zuivel Vereniging ..	19	—	—	4	4	15
28. Valsch River Co-operative Cattle and Dairy Society	9	—	—	—	—	9
29. Vrede Koöperatieve Landbouw Vereniging ..	28	19	4	—	23	492
30. Waterberg Landbouwers Koöperatieve Vereniging	15	11	2	62	75	101
31. Wolmaransstad Coöperatieve Landbouw Vereeniging	24	10	3	37	50	304
	1,210	703	78	214	995	9.658

It will be noticed that in many cases the withdrawals during the year exceed the enrolments. In every such instance the society concerned is one of those established in the commencement of the co-operative movement, when hardly any discrimination was made by the majority of Boards in accepting applications for membership. Farmers flocked to the societies, attracted by the pernicious credit system prevailing in those days in connection with the sale of farming requisites, and the membership consequently increased by leaps and bounds. But while the serious warnings issued by this Division in regard to this matter from the very inception of the movement did not always have the desired effect, the societies have in late years through hard experience come to realise that their former method of treating the acceptance of new members merely as a matter of form was one of the most important defects in their earlier management. Not only do the directors now exercise greater care in this connection, but there is also a steady cleansing process in the societies by the expulsion of useless members and the voluntary resignation of those who joined under conditions which no longer prevail in regard to the supply of agricultural requirements. So that although the membership of many of the societies is not numerically as strong to-day as in former years, there is at present a general improvement in the stamp of the member admitted.

POSITION OF INDIVIDUAL SOCIETIES.

The following brief reference to each society will furnish a rough indication of the degree of success with which its operations have been attended.

In order to obtain a correct idea of the financial postiion of each society, it will be necessary to refer to the "Table of Assets and Liabilities" on page 135 of this report.

CENTRAAL WESTELIJKE COÖPERATIEVE LANDBOUW VEREENIGING.

During the financial year ended 31st May, 1918, actual working operations resulted in a nett profit of £1,470 7s. 5d., which figure has been debited with £410 10s. 0d. for depreciation, £706 8s. 0d. for bad debts, and £245 0s. 3d. being balance of the loss sustained during the previous year, leaving a nett profit of £108 9s. 2d. The society continues to make good progress .

Summary of Transactions for the Last Two Years:—

	1917.	1918.
Produce:		
Mealies sold	74,401 bags.	121,911 bags.
Value of other produce sold	£1,251	£826 19 0
Farming Requisites:		
Value of machinery, etc., sold to members ..	£13,731	£28,119 14 10

Land Bank Advances:—

Form of Loan.	Amount granted.	Amount owing at 31/5/18.	How Repayable.
	£	£ s. d.	
Instalment	5,000	4,375 0 0	In half-yearly instalments of £312 10s. and a final instalment of £4,062 10s.
Cash Credit	95,000	9,524 16 9	At call.
	£100,000	£13,899 16 9	

ERMELO COÖPERATIEVE VEREENIGING.

The financial statements for the year ended 31st December, 1918, show a profit for that period of £687 9s. 6d., after allowing £494 0s. 3d. for depreciation.

The Members' Fund now stands at £7,364 13s. 11d., as compared with £6,394 5s. 9d. at the end of the previous year.

This society is maintaining the rate of progress made during the previous years.

Summary of Transactions for the Last Two Years:—

	1917.	1918.
Produce:		
Mealies sold	30,654 bags.	41,335 bags.
Value of other produce sold	£32,452	£25,700
Farming Requisites:		
Value of machinery, etc., sold to members ..	£21,605	£10,550

Land Bank Advances:—

Form of Loan.	Amount granted.	Amount owing at 31/12/18.	How Repayable.
	£	£ s. d.	
Instalment	3,500	5,842 3 9	In half-yearly instalments of £218 15s.
Instalment	2,500		In half-yearly instalments of £156 5s. each.
Instalment	2,000		In half-yearly instalments of £125 each.
Cash Credit	22,000	9,465 6 0	At call.
	£30,000	£15,307 9 9	

EXCELSIOR KOÖPERATIEVE ZUIVEL VERENIGING.

This society is engaged in the manufacture of cheese and the supply of dairy requisites to members. The financial statements for the first year, which ended on the 30th September, 1918, show a net profit for that period of £21 7s. 9d. This society had several difficulties to contend with during the first year of its existence, as a result of which the question of dissolution is being seriously considered.

Summary of Transactions for the Last Two Years:—

	1918.
Produce:	
Cheese sold	46,535 lbs.
Pigs sold	£74 14 0
Farming Requisites:	
Value of dairy requisites sold to members	£64 4 6

Land Bank Advances:—

Form of Loan.	Amount granted.	Amount owing at 30/9/18.			How Repayable.
	£	£	s.	d.	
Instalment	1,900	1,900	0	0	In six-monthly instalments of £118 15s. each.
Cash Credit	4,100	1,715	0	0	At call.
	£6,000	£3,615	0	0	

FRANKFORT KOÖPERATIEVE LANDBOUW VERENIGING.

The first financial year ended on the 31st May, 1918. The results attending the operations of this society during that period were very satisfactory, the financial statements disclosing a nett profit of £1,089 13s. 4d.

Summary of Transactions for the Last Two Years:—

	6 months ending 31.12.17.	1918.
Produce:		
Mealies sold	17,226 bags.	43,730 bags.
Value of other produce sold	—	£190
Farming Requisites:		
Value of machinery, etc., sold to members ..	£2,568	£8,861 8 4

Land Bank Advances:—

Form of Loan.	Amount granted.	Amount owing at 31/5/18.			How Repayable.
	£	£	s.	d.	
Instalment	2,000	2,000	0	0	In sixteen half-yearly instalments of £125 each.
Cash Credit	25,000	Nil			At call.
	£27,000	£2,000	0	0	

HEIDELBERG COÖPERATIEVE LANDBOUW VEREENIGING.

The financial statements for the year ended 31st May, 1918, disclose a profit of £291 14s. 8d., after writing off £281 6s. 9d. for depreciation. This society is well managed.

Summary of Transactions for the Last Two Years:—

	1917.	1918.
Produce:		
Mealies sold	33,243 bags.	56,229 bags.
Value of other produce sold	£5,000	£2,000
Farming Requisites:		
Value of machinery, etc., sold to members ..	£14,438	£13,220

Land Bank Advances:—

Form of Loan.	Amount granted.	Amount owing at 31/5/18.			How Repayable.
	£	£	s.	d.	
Cash Credit	30,000	10,500	0	0	At call.

HOBHOUSE KOÖPERATIEVE ZUIVEL VERENIGING.

This is a cheese-making society. It was established during this year, and has already commenced active business.

Hoogeveld-Eendracht Boeren Coöperatieve Vereeniging.

This society has not yet recovered from the effects of earlier mismanagement, while it is further seriously handicapped in its operations by the heavy outstanding accounts. The financial statements for the year ended 31st May, 1918, disclose a profit of £3,340 8s. 11d. for the year's working, but this had to be utilised to make good the loss of maize referred to in my previous report.

Summary of Transactions for the Last Two Years:—

	1917.	1918.
Produce :		
Mealies sold	80,728 bags.	37,558 bags.
Value of other produce sold	£2,208	£2,295 16 1
Farming Requisites :		
Value of machinery, etc., sold to members ..	£11,396	£9,645 9 0

Land Bank Advances:—

Form of Loan.	Amount granted.	Amount owing at 31/5/18.	How Repayable.
	£	£ s. d.	
Instalment	3,000	3,937 10 0	In half-yearly instalments of £500.
Instalment	6,000		In half-yearly instalments of £1,000.
Instalment	1,000		In half-yearly instalments of £62 10s. A final instalment of £875.
Cash Credit	39,000	28,740 19 7	At call.
	£49,000	£32,678 9 7	

De Kestell Koöperatieve Zuivel Vereeniging.

This is also a cheese-making society. The operations for the twelve months ended 30th September, 1918, resulted in a profit of £486 15s. 3d., after writing off £267 19s. 1d. for depreciation on buildings and plant. The Members' Fund now stands at £606 12s. 10d.

Summary of Transactions for the Last Two Years:—

	1917.	1918.
Produce :		
Cheese sold	51,979 lbs.	111,920 lbs.
Farming Requisites :		
Value of dairy requisites sold to members ..	£140	£105

Land Bank Advances:—

Form of Loan.	Amount granted.	Amount owing at 30/9/18.	How Repayable.
	£	£ s. d.	
Instalment	2,000	2,000 0 0	In half-yearly instalments of £125 each.
Cash Credit	4,000	2,250 0 0	At call.
	£6,000	£4,250 0 0	

Kopjes Koöperatieve Zuivel Vereniging.

This society, established at the Kopjes Settlement, is engaged in the supply of dairy cattle and dairy requisites, and the distribution of milk. The administration costs for the year ended 31st August, 1918, amounted to £17 11s. 9d. more than the commission earned during that period. The society is otherwise making satisfactory progress.

Land Bank Advances:—

Form of Loan.	Amount granted	Amount owing at 31.8.18.
	£	£ s. d.
Cash Credit	2,500	1,948 19 6

KOSTER COÖPERATIEVE LANDBOUW VEREENIGING.

After a very inauspicious beginning, this organisation has developed into a very promising society. During the year ended 30th June, 1918, actual working operations resulted in a profit of £630 16s. 3d.

Summary of Transactions for the Last Two Years:—

	1917.	1918.
***Produce*:**		
Mealies sold	12,300 bags.	27,817 bags.
Value of other produce sold	£1,274	£2,023
***Farming Requisites*:**		
Value of machinery, etc., sold to members ..	£5,355	£6,090

Land Bank Advances:—

Form of Loan.	Amount granted.	Amount owing at 30.6.18.	How Repayable.
	£	£	
Instalment	1,000	1,000	In half-yearly instalments of £333 6s. 8d. each.
Cash Credit	34,000	9,400	At call.
	£35,000	£10,400	

LICHTENBURG KOÖPERATIEVE LANDBOUW VERENIGING.

The volume of business transacted during the present year compares very favourably with that of the previous year, as will be seen from the statement given below . The society is, however, still severely handicapped in its operations by the heavy outstanding accounts. The financial statements for the year ended 31st May, 1918, show a profit of £56 19s. 0d. after setting aside £1,000 as a further reserve for bad and doubtful debts.

Summary of Transactions for the Last Two Years:—

	1917.	1918.
***Produce*:**		
Mealies sold	78,300 bags.	157,650 bags.
Value of other produce sold	£4,103	£4,126
***Farming Requisites*:**		
Value of machinery, etc., sold to members ..	£7,720	£14,002

Land Bank Advances:—

Form of Loan.	Amount granted.	Amount owing at 31.5 18	How Repayable.
	£	£ s d.	
Instalment	11,000	8,250	In half-yearly instalments of £687 10s. each.
Cash Credit	28,000	28,579 3 7	At call.
	£39,000	£36,829 3 7	

LINDLEY BOEREN KOÖPERATIEVE VERENIGING.

This is one of the new grain societies established during the year. The prospects of this society are most encouraging and I am quite confident as to its future.

Summary of Transactions for the period up to 31/12/18.

	Six months ended 31/12/18.
Produce :	
Mealies sold	30,088 bags.
Value of other produce sold	£241 15 8
Farming Requisites .	
Value of machinery, etc., sold to members	£795 17 0

Land Bank Advances—

Form of Loan.	Amount granted.	Amount owing at 31.12.18.	How Repayable.
	£	£ s. d.	
Instalment	3,000	5,000	In half-yearly instalments of £187 10s.
Instalment	6,000		In half-yearly instalments of £375.
Cash Credit	54,000	25,274	At call.
	£63,000	£30,274	

Lijdenburg Koöperatieve Landbouw Vereniging.

The position in which this society finds itself is a very strong one. The financial statements for the year ended 31st May, 1918, disclose a profit for that period of £1,845 15s. 7d., which amount, together with previous profits, etc., represents a total reserve of £10,443 13s. 0d.

Summary of Transactions for the Last Two Years :—

	1917.	1918.
Produce :		
Mealies sold	5,735 bags.	6,800 bags.
Value of other produce sold	£32,700	£32,800
Farming Requisites :		
Value of machinery, etc., sold to members	£6,000	£6,100

Land Bank Advances—

Form of Loan.	Amount granted.	Amount owing at 31.5.18.	How Repayable.
	£		
Cash Credit	3,500	Nil	At call.

Magaliesberg Koöperatieve Tabakplanters Vereniging.

Excellent progress continues to be made by this society. As a result of the operations during the year ended 28th February, 1919, a further sum of £3,293 14s. 10d. has been added to the Reserve Fund, which now stands at £21,856 17s. 8d.

Summary of Transactions for the Last Two Years :—

	1917.	1918.
Produce :		
Tobacco sold	2,356,901 lbs.	1,534,621 lbs.

Land Bank Advances :—

Form of Loan.	Amount granted.	Amount owing at 28.2.19.	How Repayable.
	£		
Instalment	10,000	Nil	—
Cash Credit	30,000	Nil	—

MARICO BOEKEN COÖPERATIEVE VERÉENIGING.

This is a small society and, as former annual reports of this division will show, has not worked during any period of its existence with any degree of success. The financial statements for the year ended 30th June, 1918, disclose a loss for that period of £438 19s. 9d., after writing off £108 14s. 4d. for depreciation and setting aside a further sum of £250 for bad and doubtful debts.

Summary of Transactions for the Last Two Years:—

	1917.	1918.
Produce:		
Mealies sold	2,383 bags.	3,633 bags.
Value of other produce sold	£4,258	£3,936 17 9
Farming Requisites:		
Value of machinery, etc., sold to members ..	£1,303	£1,632 11 11

Land Bank Advances:—

Form of Loan.	Amount granted.	Amount owing at 30.6.18.	How Repayable.
	£	£ s. d.	
Cash Credit	5,000	3,529 11 3	At call.

MIDDELBURG LANDBOUWERS COÖPERATIEVE VEREENIGING.

The business of this society is, on the whole, well conducted, the only unsatisfactory feature is the outstanding accounts, in which, however, a steady improvement is noticeable. The operations for the twelve months ended 30th June, 1918, resulted in a nett profit of £166 18s. 2d.

Summary of Transactions for the Last Two Years:—

	1917.	1918.
Produce:		
Mealies sold	84,937 bags.	80,779 bags.
Value of other produce sold	£8,030	£7,422 11 1
Farming Requisites:		
Value of machinery, etc., sold to members ..	£21,644	£24,793 19 6

Land Bank Advances—

Form of Loan.	Amount granted.	Amount owing at 30.6.18.	How Repayable.
	£	£ s. d.	
Instalment	3,000	1,000	In half-yearly instalments of £500 each.
Cash Credit	57,000	23,550 14 3	At call.
	£60,000	£24,550 14 3	

OLIFANTSRIVIER COÖPERATIEVE DORSCHWERK.

This society carries on threshing operations. There was a considerable falling off in the income derived from threshing operations during the year ended 31st December, 1918, compared with former years as a result of which the financial statements for the period mentioned show a loss of £274 3s. 0d.

Land Bank Advances:—

Form of Loan.	Amount granted.	Amount owing at 31.12.18.	How Repayable.
	£	£ s. d.	
Instalment	500	83 6 8	In half-yearly instalments of £83 6s. 8d.

PRETORIA LANDBOUW KOÖPERATIEVE VERENIGING.

As stated in former reports this society has not at any period of its existence been able to make any headway. It is transacting practically no business and I am of opinion that it should be dissolved. The financial statements for the year ended 28th February, 1919, disclose a loss of £199 10s. 11d.

Summary of Transactions for the Last Two Years:—

	1917.	1918.
Produce:		
Mealies sold	1,186	Nil
Value of other produce sold	£135	Nil
Farming Requisites:		
Value of machinery, etc., sold to members ..	£190	Nil

Land Bank Advances:—

Form of Loan.	Amount granted.	Amount owing at 28.2.19.	How Repayable.
	£	£ s. d.	
Instalment	7,500	6,642 17 9	In monthly instalments of £50 inclusive of interest.
Cash Credit	5,000	1,349 17 8	At call.
	£12,500	£7,992 15 5	

RUSTENBURG BOEREN KOÖPERATIEVE VERENIGING.

In the previous report of this Division reference was made to the necessity of effecting a re-organisation of this society, with a view to adjusting the somewhat unsatisfactory state of affairs brought to light as a result of investigations made by my inspectors. Since then further Board Meetings were attended by me and it is hoped that with the re-organisation effected the society's position will improve. The financial statements for the year ended 31st January, 1919, disclose a profit of £294 0s. 6d., which has been utilised to strengthen the reserve for bad and doubtful debts.

Summary of Transactions for the Last Two Years:—

	1917.	1918.
Produce:		
Mealies sold	2,416 bags.	5,275 bags.
Value of other produce sold	£2,654	£16,421 4 0
Farming Requisites:		
Value of machinery, etc., sold to members ..	£21,662	£9,083 15 0

Land Bank Advances—

Form of Loan.	Amount granted.	Amount owing at 31.1.19.	How Repayable.
	£	£ s. d.	
Instalment	7,000	4,823 8 9	In half-yearly instalments of £437 10s. each.
Cash Credit	17,000	15,621 2 9	At call.
	£24,000	£20,444 11 6	

SENEKAL KOÖPERATIEVE LANDBOUW VERENIGING.

This is one of the societies established during the period under review. Its main objects are the sale of the members' produce and the supply of grain bags and wool packs. During the six months ended 31st December, 1918, the society received 52,821 bags of maize from its members, 32,000 of which were disposed of during that period at prices which ranged considerably above those offered by the local buyers.

Land Bank Advances:—

Form of Loan.	Amount granted.	Amount owing at 31.12.18.	How Repayable.
	£	£	
Instalment	4,000	1,925	In half-yearly instalments of £250.
Cash Credit	50,000	28,000	At call.
	£54,000	£29,925	

STANDERTON COÖPERATIEVE BOEREN VEREENIGING.

The financial statements for the year ended 31st May, 1918, disclose a profit of £128 5s. 1d., after writing off £562 3s. 4d. for depreciation on buildings and plant.

The society is still severely handicapped in its operations by the heavy outstanding accounts. The butchery branch of the business has been closed upon the recommendation of this Division.

Summary of Transactions for the Last Two Years:—

	1917.	1918.
Produce:		
Mealies sold	41,376 bags.	66,968 bags.
Value of other produce sold	£15,692	£22,612
Farming Requisites:		
Value of machinery, etc., sold to members ..	£26,355	£13,670

Land Bank Advances:—

Form of Loan.	Amount granted.	Amount owing at 31.5.18.	How Repayable.
	£	£ s. d.	
Instalment	6,000	3,968 15 0	In half-yearly instalments of £1,000 each.
Instalment	2,100		In half-yearly instalments of £131 5s., and a final instalment of £1,706 5s.
Cash Credit	45,000	32,743 8 6	At call.
	£53,100	£36,712 3 6	

VREDE KOÖPERATIEVE LANDBOUW VERENIGING.

The financial statements for the year ended 31st May, 1918, disclose a profit for that period of £1,649 10s. 7d. The outstanding accounts remain an unsatisfactory feature in connection with this society.

Summary of Transactions for the Last Two Years:—

	1917.	1918.
Produce:		
Mealies sold	7,890 bags.	37,592 bags.
Value of other produce sold	£8,311	£15,930
Farming Requisites:		
Value of machinery, etc., sold to members ..	£18,648	£15,745

Land Bank Advances:—

Form of Loan.	Amount granted.	Amount owing at 31.5.18.	How Repayable.
	£	£ s. d.	
Instalment	2,250	2,250 0 0	In half-yearly instalments of £140 12s. 6d. each.
Cash Credit	27,750	14,490 6 9	At call.
	£30,000	£16,740 6 9	

Waterberg Landbouwers Koöperatieve Vereniging.

The improvement in the general position of this society, referred to in my last report, is being maintained. While during the last five years the financial statements have always shown a loss, the working operations for the past year have resulted in a nett profit of £313 10s. 11d. A very satisfactory feature is also the great improvement effected in the position of the outstanding accounts.

Summary of Transactions for the Last Two Years:—

	1917.	1918.
Produce:		
Mealies sold	2,975 bags.	4,716 bags.
Value of other produce sold	£871	£806
Farming Requisites:		
Value of machinery, etc., sold to members ..	£1,688	£1,553

Land Bank Advances:—

Form of Loan.	Amount granted.	Amount owing. at 31.7.18.	How Repayable.
	£	£ s. d.	
Instalment	1,000	687 10 0	In half-yearly instalments of £62 10s. each.
Cash Credit	5,000	1,850 0 0	At call.
	£6,000	£2,537 10 0	

Wolmaranstad Coöperatieve Landbouw Vereeniging.

This society continues to make good progress, although more attention should be given to the outstanding accounts. The financial statements for the year ended 31st May, disclose a profit of £1,080 15s. 9d. on the year's working, after writing off £149 11s. 4d. for depreciation and setting aside a further sum of £228 11s. 7d. for bad debts.

Summary of Transactions for the Last Two Years:—

	1917.	1918
Produce:		
Mealies sold	£11,768 bags.	30,534 bags.
Value of other produce sold	10,004	£4,652
Farming Requisites:		
Value of machinery, etc., sold to members ..	£6,737	£8,087

Land Bank Advances:—

Form of Loan.	Amount granted.	Amount owing at 31.5.18.	How Repayable.
	£	£ s. d.	
Instalment	3,000	333 6 8	In half-yearly instalments of £166 13s. 4d.
Cash Credit	19,000	13,429 17 8	At call.
	£22,000	£13,763 4 4	

Kestell Koöperatieve Vee en Zuivel Vereniging.

The main object of this society is the supplying of dairy live stock to its members, and it has been carrying on business for about a year. The amount of the loan granted by the Land Bank to the society was £3,000 of which £2,576 5s. 6d. was owing to the bank at 30th September, 1918. The remaining societies of this description are:—

Aasvogelkrans Koöperatieve Vereniging, Koolspruit Koöperatieve Vee en Zuivel Vereniging, Lindley Koöperatieve Vee en Zuivel Vereniging, Manitoba Koöperatieve Zuivel Vereniging, Unie Koöperatieve Vee en Zuivel Vereniging, Valsch River Co-operative Cattle and Dairy Society.

These, as the names indicate, are all dairy livestock societies. They have all been established during the present year and have already commenced active business.

Assets and Liabilities of Societies.

The Balance Sheets of the different societies are published in the following form in order to avoid a repitition of the various items constituting the Assets and Liabilities:—

Table of Assets and Liabilities.

SOCIETY,	LIABILITIES.						ASSETS.							
	Land Bank.	Local Bank.	Sundry Creditors.	Produce to be Credited to Members.	General Reserve.	Reserve for Bad and Doubtful Debts.	Properties less Depreciation.	Plant less Depreciation.	Stocks on hand.	Sundry Debtors, Members.	Sundry Debtors, Non-Members.	Central Agency.	Cash.	Stocks Produce.
	£	£	£	£	£	£	£	£	£	£	£	£	£	£
Centraal Westelijke ..	13,900	790	—	60,796	3,349	500	4,804	603	5,110	65,061	58	1,578	118	2,003
Ermelo	15,307	—	3,952	296	7,365	200	3,711	2,639	3,441	7,731	2,468	3,548	2,823	759
Excelsior	3,648	146	351	—	33	—	1,138	829	587	9	1,615	—	—	—
Frankfort	2,767	—	651	1,466	1,165	—	1,224	61	619	4,044	95	—	6	—
Heidelberg	10,859	1,310	3,688	—	1,602	—	3,140	285	3,751	1,992	54	2,385	2	5,850
Hoogeveld	32,678	—	2,626	—	4,975	106	9,321	480	5,038	13,459	224	6,130	211	5,522
Kestell Zuivel	4,268	—	377	—	607	—	1,922	610	2,667	14	39	—	—	—
Kopjes	1,949	—	292	—	74	—	—	—	13	2,266	23	—	13	—
Koster	10,400	—	281	—	114	631	889	456	641	8,003	66	245	241	858
Lichtenburg	36,829	4,806	4,231	—	7,714	3,264	12,795	485	2,099	35,442	2,104	648	38	3,233
Lijdenburg	—	—	4,579	—	10,444	561	1,071	67	1,615	6,434	2,490	—	3,907	—
Magaliesberg	—	—	2,593	18,667	21,857	—	6,215	288	863	2,246	877	—	14,808	17,820
Marico	3,530	—	671	—	83	2,901	477	79	272	4,675	1,213	—	469	—
Middelburg	24,551	—	5,455	—	4,600	1,720	2,000	1,072	3,771	16,270	2,264	811	1,296	8,842
Olifantsrivier	83	310	169	—	1,466	150	—	1,101	—	1,069	—	—	8	—
Pretoria	7,993	—	74	—	—	800	5,577	415	—	2,730	24	50	71	—
Rustenburg	20,445	—	1,038	—	2,740	1,385	6,520	1,200	2,341	9,179	2,748	—	1,368	2,252
Standerton	36,712	—	3,211	3,519	5,096	2,000	6,947	595	6,819	22,839	4,518	2,880	5,940	—
Vrede	16,740	—	3,196	—	4,523	1,279	1,913	533	2,848	15,054	3,927	17	1,127	319
Waterberg	2,537	—	1,946	—	519	1,100	394	240	233	2,632	140	136	350	1,977
Wolmaransstad ..	13,763	1,676	827	6	2,931	800	4,101	329	809	12,012	211	815	279	1,447
	258,959	9,038	40,208	84,750	81,257	17,397	74,159	12,367	43,537	233,161	25,158	19,243	33,075	50,909

Statement of Administration Charges and Turnovers of Societies during the last Financial Year.

	Turn-over.	Salaries and Wages.	Interest and Bank charges.	Rent.	Station-ery.	General ex-penses.	In-surance.	Audit Fees.	Tele-phones.	Travel-ling ex-penses.	Re-pairs.	Direc-tors' Fees.	Legal ex-penses.	Motor ex-penses.	Depre-ciation.	Fuel.	Hessian and packing.	Total.
	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£
Centraal Westelijke	72,750	2,051	—	115	79	89	88	66	—	155	—	—	2	—	411	—	—	3,056
Ermelo	70,250	2,172	456	216	—	232	127	—	32	37	—	—	3	—	494	—	—	3,769
Excelsior	1,650	254	113	—	12	28	8	—	—	—	—	—	2	—	90	—	—	507
Frankfort	42,400	745	53	68	61	109	31	—	16	73	—	—	7	—	39	—	—	1,202
Heidelberg	37,000	1,199	—	23	63	146	101	62	22	34	—	—	—	—	281	—	—	1,931
Hoogeveld	56,903	1,746	540	61	62	253	184	58	—	133	14	—	113	117	118	—	—	3,399
Kestell Zuivel ..	5,300	668	209	6	32	103	20	11	—	24	35	—	7	—	268	55	—	1,438
Kopjes	1,179	60	81	—	7	6	—	6	—	—	—	—	—	—	—	—	—	160
Koster	20,498	852	—	29	23	48	31	50	—	16	—	49	28	—	106	—	—	1,232
Lichtenburg	81,517	2,288	1,110	106	75	151	42	104	57	160	—	126	70	—	12	—	—	4,301
Lijdenburg	35,000	874	—	—	—	231	—	—	—	—	—	—	—	—	127	—	—	1,232
Magaliesberg	61,761	3,412	87	156	94	217	225	75	—	51	—	202	44	—	534	163	917	6,177
Marico	7,500	416	219	—	—	162	32	35	—	—	—	53	—	—	109	—	—	1,026
Middelburg	99,650	1,979	1,710	48	57	331	194	68	—	—	22	155	33	—	261	—	—	4,858
Olifantsrivier	—	288	—	—	—	58	—	21	—	—	333	53	—	—	124	—	—	927
Pretoria	—	—	265	66	9	99	23	—	—	—	—	71	—	—	165	—	—	698
Rustenburg	47,800	1,029	253	11	72	205	102	50	56	88	—	85	37	54	153	—	—	2,195
Standerton	93,400	3,314	897	108	116	435	123	72	94	128	46	114	49	226	580	—	—	6,302
Vrede	63,370	1,521	428	35	43	237	68	42	28	65	23	163	14	72	315	—	—	3,054
Waterberg	4,250	366	—	—	7	27	34	30	12	18	89	44	—	—	71	—	—	698
Wolmaransstad —	36,650	642	110	16	75	150	36	33	—	153	5	—	22	—	150	—	—	1,392
	838,828	25,876	6,531	1,064	887	3,317	1,519	783	317	1,135	567	1,115	431	469	4,408	218	917	49,553

Central Agency for Co-operative Societies, Limited.—The remarks made in my last report as to the progress made and good work performed by this Agency continue to apply. The accumulated profits and reserves amounted to £11,701 at 30th June, 1918, as compared with £2,244 four years ago.

Annual Co-operative Congress.—The Sixth Congress of Representatives of Co-operative Societies in the Transvaal and Orange Free State Provinces was held in Pretoria recently. A report of the proceedings is being printed in English and Dutch, and will be obtainable on application to the Government Printer.

JOHS. RETIEF.
Registrar of Co-operative Agricultural Societies.

APPENDIX XIII.

DIVISION OF DRY-FARMING.

1. The functions of the Division comprise (1) the dissemination of advice on problems relating to the growing of grain, root and fodder crops, trees, etc., under one or other of the six dry-farming methods in vogue; (2) distribution among farmers (on the co-operative system) of selected seeds best suited to the different soil and climatic conditions throughout the Union; (3) studies to acquire (a) precise information on the agricultural and botanical characters of crop varieties hitherto not grown at all or not yet extensively cultivated in this country, (b) their suitability on various soils and under different climatic conditions of the Union, drought or rust resistant qualities, commercial value, etc., (4) demonstrations to farmers, individually and collectively, on the selection of the best seeds, the best stage for harvesting different crops to be used for various purposes; selection of the best soil for different crop varieties, proper preparation of the seed beds, the proper manner to set, adjust and use certain agricultural implements; (5) determination and classification of various seeds and the correction of common errors in nomenclature, a matter which in the past has caused considerable confusion among seedsmen and farmers themselves; (6) exhibition, at agricultural shows and farmers' gatherings, of various products produced under dry-farming methods with the objects of (a) encouraging farmers to produce more, (b) showing farmers the different varieties (under their correct names) which were tested and selected by us, (c) giving farmers the opportunity to ask questions, gain information, and state their own experience and views; (8) inspecting farms for deserving people wishing to buy ground, and reporting on the soil and climatic conditions, best crops to grow, etc., on such farms. (This work is always done in conjunction with the other work of the Division.); (9) lecturing at farmers' meetings, before Farmers' Associations, to advanced pupils at public schools, and often to agricultural students at universities. At these lectures also, ample opportunity is accorded to those present to ask questions pertaining to agricultural matters, on results obtained from experiments, etc., and also to state their own experience and views.

II. *Co-operative Experiments with Farmers*: Through our experiment stations and also by the help of a limited number of farmers, who over a number of years have conducted co-operative experiments for us over the Union, much valuable and irrefutable experimental evidence has been obtained to show that an enormous acreage hitherto not cultivated can successfully be placed under useful crops, provided that farmers can obtain the various seed varieties, suited to the different soil and climatic conditions of the Union and provided they get the much needed information with regard to the proper and timely preparation of the land, the conservation of soil-moisture, etc.

The seed of most of the crop varieties tested, were imported by us in limited quantities, from oversea countries. The average farmer, therefore, had to buy such "new" varieties from us. A comparatively small portion of the well-to-do class of farmer purchased most of the tested seeds every year, and in many cases valuable seed was milled for bread-making purposes after harvest time, while our object always was to give to as many farmers as possible over the whole Union an equal opportunity to benefit by the results obtained at the Government Experiment Stations. When seed is sold to a farmer, he is naturally at liberty to do with it what he likes and we cannot compel him to report results to us, while, under the co-operative system, we not only get results properly reported on printed forms issued by us, but we also get the seed back after harvest time. In this manner we practically bind down a number of the best farmers in each district to conduct experiments for their own benefit, to send in regular reports for the information of the Department, and to supply us with seed to help more farmers every year. For these and other important reasons, the Minister of Agriculture has, some two years ago, granted permission to extend the co-operative system, with the result that we have, during the period under review, supplied various seeds to 433 farmers who have conducted 1,045 experiments in 76 districts of the Union. It is very encouraging to find with what great success various plant varieties supplied and recommended by us have been grown in different parts, and great appreciation has been expressed by our co-operative experimentalist farmers for the tangible assistance rendered, and also for the valuable crop varieties introduced into their districts by the Department. In previous years, it was our rule that each farmer returns to us (after harvest time) the same amount and variety of seed as we have issued to him, and in case of a crop failure, through no fault of his, such a farmer is not expected to return any seed. In order, therefore, to make up for crop losses sustained through abnormal rains, floods, frost, hail, etc., we have requested that the successful co-operative farmers must, in future, return to us twice the amount of seed supplied to them. All our co-operative farmers have very willingly agreed to this new arrangement, so that during the ensuing year, we will receive a double share of seed from the successful growers.

Time of Purchasing and Delivery of Fresh Seeds for Co-operative Experiments: After our co-operative experimentalists have, according to contract, returned the seeds to us, and after having selected seed for their own use, they generally have a surplus stock for sale, and it is from this source that we must buy most of our seeds for further distribution. The best time to buy the best seed at a comparatively low price is while the crops are ripening on the lands, *viz.*: October, November, December. The funds from which we have to purchase fresh seeds are generally voted by Parliament in April every year. We are not allowed to buy or order seed before the money has actually been voted. April is already the sowing season when the bulk of the best seed has already been sold and what remaining seed there is still to be found during this time of the year is very scarce, difficult to obtain and expensive, so by the time we are at liberty to buy and deliver seed to applicants, some of whom live many hundreds of miles away, others many miles from a railway, etc., the sowing season for some varieties is so far advanced that in many cases the seed arrives too late and has to be kept over for the next season. In such cases, the farmer not only loses a whole season, but there is always the danger of weevil, mice and other vermin doing damage to valuable seeds, while we have to wait two years before we can get the seed back for distribution among other farmers.

Varieties which have again done well with most of our co-operative farmers are the following:

Wheat (*Durums*): Kubanka, Bontaar, Black Don, Yellow Nicaragua, Black Persian, Black Goose, Black Nicaragua, Theunissen, Medeah, S.A. Medeah, Wild Goose, Harmse, Beloturka, Polonicum, Belum, Goldenball, Arnautka, Blignaut and Taute.

Vulgare (*Soft Varieties*): Long-eared Rieti, Red Egyptian, Maine's Patent, Early Gluyas, Sunset, Klein Koring, Marquis, Pusa 4, and Primrose.

Stock Feed: Emmer Wheat, Hajira, Summer Oats, Rye (blue and large white), Dwarf Millo, Minnesota Black Amber, Millo Maize, Manchu Brown, Red Amber (Sorghums are mostly used for silage purposes), Kikuyu, Napier and Soudan Grass, Tree Lucerne, Cattle Turnips, Cattle Melons and Various Pumpkins, Nigerian, Golden and Red Millet, Peanuts and Chufa Nuts.

Maize: Saharah Yellow, Burlington Hybrid, Eureka, Pride of Saline, Hickory King, Iowa Silver Mine, American 8 Row Flint (yellow). *Saharah Yellow* was some years ago imported by us from South America. It was claimed that this variety could subsist and mature on poorer soils than most other varieties. We have, for two consecutive years, put it through a very severe test on the Lichtenburg Dry-land Station, with the necessary control plots, and found that while the varieties on the controls failed the Saharah did well. Many co-operative farmers, who have received seed from us, have reported the same experimental evidence to us.

Beans: St. Faire, Longfellow, Haricot, Lima, Magnum Bonum, Yellow-Podded-Wax,

III. GOVERNMENT DRY-LAND EXPERIMENT STATION AT PIETERSBURG.

We have again, during the period under review, received many letters and verbal statements from farmers expressing their gratitude for the valuable information and great help that this Station has given them. The sphere of influence of this Institution could have been greatly extended, were it not that the amount allotted to it yearly is so hopelessly inadequate, and especially in these abnormal times when everything is up in price.

The following statement from Mr. G. H. Trollope, the Manager-in-Charge, will show the experiments conducted during the year, viz.:—

" During the period under review experiments were conducted with various summer and winter crops, testing their rust and drought resistance as well as their other qualities.

" *Winter Wheats*: Of the various varieties tested, the four following resisted both rust and drought, and gave good results:

S.A. Medeah and Gluyas Early yielded each six bags per acre; and Polonicum Belum and Black Goose yielded each five bags per acre.

" The following varieties were also tested in small plots:

Alaska, Marquis, Sunset, Gawi, Wild Goose, Kambourika and Red Egyptian.

" These all did fairly well, and will again be tried next season, including a number of other new varieties.

" *Summer Wheat*: Black Don was again tried this summer. Results not so good as previous seasons, and showed a little rust.

" *Hajira Summer Oats*: This variety was again tried and did exceptionally well, but unfortunately it was all devoured by army worms. A number of farmers in the district have again done very well with this variety this season.

" *Maize*: The following varieties were grown:

Hickory King, Iowa Silver Mine, Bread Maize, American 8-row Flint (yellow), Minnesota No. 13 (yellow), White Cango, Pride of Saline and Potchefstroom Pearl.

"Iowa Silver Mine stood the dry season best of all varieties, and gave a return of ten bags per acre; H. King, eight bags per acre; Potchefstroom Pearl, seven and a half bags per acre. Pride of Saline did very well but was only tried on a very small scale. Minnesota No. 13 was a complete failure owing to army worms. American 8-row Flint did fairly well and will again be tried next season.

" *Hay Crops*: The following varieties of hay crops were planted and all did exceptionally well until the 10th of February, when they were attacked and completely devoured by army worms, *viz.*, Teff, Nigerian Millet, Giant Millet, Red Manna, Boer Manna, and Sudan Grass.

" *Beans and Peas*: Twelve varieties of beans and five of peas were tried, but spotted beetles were exceptionally bad during this summer, and the results were not so good as previous years. Lentils were also tried, but the crops were also destroyed by vermin.

" *Cow Peas*: Wonder and Early Black were planted, and the Wonder again gave best results. 15 acres of Wonder were planted for green manure, and were ploughed in during March.

" *Potatoes*: 'Up-to-date' and 'King of the Early' were tried, and both gave good results.

" *Pumpkins*: Four varieties were planted and all did fairly well, *viz.*: Jumbo, Boer, and two varieties of Namaqualand Pumpkin.

" *Chufa Nuts and Pea Nuts*, owing to vermin, did not do so well as previous seasons.

" *Melons*: Six varieties were tried, but owing to the unfavourable season they were very small and did not keep well.

" *Root Crops*: Two varieties of Cattle Turnips were tried and did very well up to a certain stage, when they were badly attacked by lice and the roots rotted in the ground. Several varieties of Mangels were planted but germination was bad owing to unfavourable weather.

" *Sorghums*: Five varieties were tried, *viz.*: Dwarf Milo, Minnesota Black Amber, Milo Maize, Manchu Brown, and Red Amber.

" These all did fairly well, but were badly attacked by Stalk Borer just before ripening. Minnesota Black Amber seems to be a very promising variety.

" *Sundry Grasses, etc.*: Kikuyu Grass, Napier Grass, and Tree Lucerne did very well this season.

" *Sunflower and Buck Wheat*: These crops gave very good results. Linseed was also planted, but germination was very bad. Two thousand Gums and Pines were planted during January, and up to now are doing exceptionally well. Orchards and Gum Trees have done very well this season.

" *Acreage Cultivated*: As in the past, the acreage cultivated has been limited to 200 acres, which includes moisture fallow lands, green manuring and fodder crop beds, as well as experimental plots.

" *Visiting Farmers and Agricultural Shows*: During the year I visited 180 farmers in this and adjoining districts in connection with co-operative experiments, advising and discussing the best methods of soil culture, and best varieties of crops to grow, etc. I also visited various Agricultural Shows in the Union with our Divisional Exhibit. In travelling about the districts it is indeed encouraging to see the general progress made in all branches of farming, and especially the application of dry-farming methods.

" *Co-operative Experiments*: Quite a lot of seed of various kinds were issued to farmers during the year on the co-operative experiment system, and many of the reports received are very good.

" *Visitors*: The number of advice-seeking visitors to this Station show a marked increase over last year.

" *Correspondence*: The number of letters dealt with during the period under review also exceeded that of the previous year.

" *Rainfall* for the year (1918—19) under review:

April, 0.19″; May, 0.04″; June, Nil; July, 0.02″ August, 0.93″; September, 0.12″; October, 1.58″; November, 1.79″; December, 3.91″; January, 5.28″; February, 2.12″; March, 0.70″: Total fall for year, 16.68″.

"*Financial Statement* attached":

PIETERSBURG DRY-LAND EXPERIMENT STATION. STATEMENT OF RECEIPTS AND EXPENDITURE DURING THE YEAR ENDING 31ST MARCH, 1919.

Receipts.	£	s.	d.
Sale of Seeds and Produce	138	3	10
Sale of Livestock	204	5	6
Total Cash Receipts	£342	9	4
Transfers:			
Feeding Stuffs	9	12	0
Seeds	93	1	0
Total Receipts	£445	2	4

Expenditure.	£	s.	d.
Salaries, Wages and Allowances	627	12	1
Livestock	160	5	0
General Stores and Equipment	83	8	0
Implements, Repairs, etc.	50	13	4
Seeds	23	14	3
Railings	15	10	10
Incidentals	16	12	2
Total Cash Expenditure	£977	15	8
Transfers :			
Guano	20	0	0
Seeds		2	0
Total Expenditure	£997	17	8

IV. *Staff*: Mr. A. van Ryneveld, who was appointed Lecturer and Demonstrator in 1916, was, from the date of his appointment, seconded to Defence Department. I regret to state that Mr. van Ryneveld died last year (Spanish Influenza) while still with Defence, and nobody has up to the present been appointed in his place. Mr. C. B. Dyason has been seconded from Head Office Staff to assist with the distribution of seed to co-operative farmers in our seed store. Mr. W. Kotze was appointed foreman at Pietersburg Station at a salary of £12 10s. per month. This appointment has greatly helped the manager to move more among the farmers, as it was impossible for Mr. Trollope to leave the Experiment Station without a thoroughly reliable person in his place to take charge of the work.

Personal Services of the Government Dry-Land Agronomist: During the period under review, 145 centres throughout the Union, in addition to many individual farmers and farms, were visited on the invitation of the parties concerned. The work in this connection comprises, among other things, lecturing, demonstrating, selecting and classifying of soils, and seeds, advising and answering many questions, directing and inspecting co-operative experiments, etc.

Needless to repeat here that many farmers' associations and others who applied for the services of the Government D.L.A. had to be disappointed again, owing to the fact that I have no itinerant officer to assist me. My clerical assistant, Mr. J. van den Heever, who, by force of circumstance, must most of the time remain in office, has not only dealt very ably with an enormous correspondence, but has also directed the purchase and distribution of seeds and other work of the Division during the long periods that I must be absent on duty. I have furthermore written bulletins (*a*) on the six dry-farming methods at present in vogue; (*b*) on smut in grain (Afrikaans); have been chairman of the Departmental Conference on Wheat Nomenclature; and also a member and vice-chairman of the Departmental Wheat Commission. I have, in my itinerant work over the Union, been able to see and hear much of the increase in production of many crop varieties, trees, etc., brought about by the labours of the Division.

V. *Correspondence*: The number of letters and telegrams dealt with during the year has been exceptionally heavy, and exceeded that of the previous year, while a great deal of attention had to be paid to farmers who made personal calls on this office.

H. S. du Toit.

Government Agronomist.

APPENDIX XIV.

GOVERNMENT GUANO ISLANDS.

Considering the adverse conditions and the very many difficulties under which the work of this Division had to be carried on, the results achieved during the period covered by this report were, in every respect, very satisfactory.

As predicted in my Report for 1917-18, notwithstanding the abnormal lateness of the Breeding and Collecting Seasons, the total output of guano for 1918 very nearly reached the record crop of 1914 and shows an increase of 1,046 tons, as compared with the collections of the previous year.

The total quantity of guano obtained from all sources was 8,011½ tons and, of this, the Colonial Islands produced 2,941 tons and the Northern Group 5,070½ tons, as against 2,377½ and 4,588 tons, respectively, in 1917.

Allotment and Sale of Guano.—The total quantity of guano disposed of during the whole period covered by this Report (1st January, 1918, to 31st March, 1919), was 12,400 tons and, in accordance with established practice, this was sold by allotment.

Three allotments were made, viz.:—in March and August, 1918, and February, 1919, respectively, the first of which has already been referred to and been fully dealt with in my Report for 1917-18.

In view of the fact that 6,000 tons of guano had been disposed of in the earlier allotment of 1918, only 1,000 tons were offered for sale in August, and, in consequence of the continued scarcity of fertilizers and the pressing need for the encouragement of the production of the more essential foodstuffs, particularly grain (including maize) and potatoes, the distribution of the guano in this allotment was confined to those purposes only.

In all, 3,007 applications, for a total quantity of 44,366 bags (4,436½ tons), were received in response to the Government Notice advertising the allotment and, as the majority of these were obviously not in order, the expedient of referring them to the scrutiny of the Magistrates and Field Cornets was again resorted to.

In cases where the *bona fides* of applicants were in doubt, or could not be established, or where guano was asked for, for purposes other than those contemplated in this distribution, such applications were disallowed. In all other instances, the quantities applied for, where palpably inflated, were reduced to what were considered the reasonable needs of the applicants concerned.

As the result of this scrutiny, 241 applications were disallowed and the total quantity applied for by the remaining applicants was reduced to 24,974 bags, which figure was accepted by the Allotment Board as more or less representing the actual requirements of applicants in connection with this allotment and duly considered; the distribution of the 1,000 tons being carried out on the following basis:—

> All applicants recommended for 1 to 3 bags, inclusive, were allotted in full; applicants recommended for 4 to 10 bags, inclusive, were allotted one-half, subject to a minimum of 3 bags per applicant; applicants recommended for 11 to 300 bags, inclusive, were allotted one-sixth, subject to a minimum of 5 bags per applicant and all applicants recommended for 301 bags and upwards were given one-tenth, with a minimum of 50 bags per applicant.

The third allotment above referred to, which was the first for the year 1919, was made in the middle of February of that year, when 7,000 tons of guano were offered for sale. With the view to furthering the production of wheat and rye throughout the Union, the distribution of the guano was, in this instance, restricted to the growers of those cereals only and, with the object of ascertaining individual applicants' actual manurial requirements for those purposes, the expedient was resorted to of calling upon farmers, in framing their applications, to disclose precisely the acreage of land prepared (*i.e.*, brakked) for cultivation and also the number of bags of wheat and rye, respectively, they intended sowing thereon.

In the scrutiny of the applications received in connection with this allotment, the reservation above referred to was strictly adhered to and in no instance was guano allowed for any purposes other than for the production of wheat and rye. In the case of all *bona fide* applicants, the quantities applied for were reduced to what were considered liberal supplies for the objects stated, in accordance with an approved scale on the basis of the acreage of land prepared, or available, for cultivation.

The number of applications received was 2,758, for a total of 179,649 bags (17,965 tons). Of these, 149 were disallowed, whilst the total quantity asked for in the remaining applications was reduced to 148,864 bags (14,886½ tons), in respect to which the following allotments were made, viz.:—

> All applicants recommended for 1 to 9 bags, inclusive, were allotted in full; applicants recommended for 10 to 110 bags, inclusive, were given one-half of the quantity recommended, subject to a minimum of 9 bags per applicant and all applicants recommended for 111 bags and upwards were given two-fifths of the quantity recommended, subject to a minimum of 55 bags per applicant.

The requirements of all Government Institutions, in this and earlier allotments, were met in full.

The total quantity of guano apportioned under the foregoing scale was 70,427 bags, in respect to which 1,784 allotments, representing 53,378 bags, had been taken up and paid for by the end of March, of which quantity 35,031 bags were delivered up to that date.

Cape Cross Guano Phosphate.—In addition to the foregoing distributions of guano, two allotments of Cape Cross guano phosphate were made during the period under review, viz.:—one in May, 1918, and the other in February, 1919.

In my Report for 1917-18, reference was made to the contract entered into with Mr. C. Hansmann for the acquisition of about 4,000 tons of this fertilizer, which it was hoped would all have been delivered in Cape Town in time for the sowing season of 1918. Owing however to the almost insuperable difficulties which this gentleman had to contend with, not only in the shipping of the phosphate from Cape Cross but also in its conveyance to Cape Town, it was not found possible for him to deliver more than 800 tons in time for the first allotment, which quantity was disposed of in May and June, its distribution being limited to the growers of cereals only.

In response to the Government Notice advertising this phosphate, 859 applications, for an aggregate quantity of 49,237 bags (4,923¾ tons), were received.

The quantity available was apportioned on the following basis, viz.:—

> All applicants for 1 to 6 bags, inclusive, were allotted one-half of the quantity applied for, with a minimum of 1 bag per applicant; applicants for 7 to 180 bags were given one-sixth of the quantity applied for, with a minimum of 3 bags per applicant; those for 181 to 250 bags, inclusive, one-seventh, with a minimum of 30 bags and all applicants for 251 bags and upwards were given one-eighth of the quantity applied for, with a minimum of 36 bags per applicant.

In the second allotment (February, 1919) a further 1,800 tons were offered for sale without any restrictions whatever, but, as the quantity applied for was considerably in excess of that available for disposal, its distribution was decided by allotment.

In all 369 applications, for a total of 23,936 bags (2,393½ tons), were accepted and considered, in respect to which the following allotments were made, viz.:—

> All applicants for 1 to 5 bags, inclusive, were given the quantity asked for in full and all applicants for 6 bags and upwards were allotted three-quarters of the quantity applied for, with a minimum of 5 bags per applicant.

Since the date of this allotment, further shipments of the Cape Cross phosphate have been received, but the full quantity required to complete the contract with Mr. Hansmann had not yet been delivered up to the closing date of this Report.

Guano Riddlings.—As a solace to the wine and fruit farmers, who were not permitted to participate in any of the distributions of guano or phosphate during 1918, a quantity of guano "riddlings" obtained from Dassen and Jutten Islands, and also referred to in my previous Report was offered for sale in August of that year, as being suitable for the manuring of orchards and vineyards.

In all 442 applications, for an aggregate of 27,378 bags (1,711 tons), were received, in response to the Notice advertising these riddlings and, as the total quantity of this material available, for disposal, was only 435 tons this was distributed on the following basis:—

> Applicants for 1 to 5 bags, inclusive, were allotted in full; applicants for 6 to 80 bags, inclusive, were given 5 bags each, plus one additional bag for every 5 or fraction thereof of the balance of the total quantity applied for and those for 81 bags and upwards were given 6 bags each, plus one additional bag for every six or fraction thereof of the balance of the total quantity applied for.

Revenue and Expenditure.—The total revenue derived from the sale of guano, Cape Cross phosphate, riddlings, seal skins, penguin eggs, etc. (exclusive of gratis issues of guano to other Divisions valued at £1,050) for the financial year 1918-19, amounted to £132,518 4s. 3d. and the total expenditure for the same period, including that incurred on the purchase of the phosphate, but excluding free services valued at £112 6s., was £83,848 2s. 11d.

The expenditure and revenue in connection with the purchase and sale, respectively, of the Cape Cross guano phosphate is charged and credited to Loan Vote Account.

Delivery of Guano.—Considering the many difficulties which had to be contended with in the bringing up of sufficient supplies of guano in time for meeting the requirements of the various allotments and also the very largely increased quantities of guano and other fertilizers handled during the period covered by this Report, deliveries were effected in record time. A slight delay took place in completing the delivery in connection with the first allotment in 1918, but this was quite unavoidable.

Guano Production.—It is very gratifying to be able to report a return to a normal state of affairs, in so far as the breeding season 1918-19 is concerned. Conditions on the coast throughout that period were all that was necessary to ensure an excellent return of guano from the various islands. It is impossible at the date of writing this Report, to give any reliable estimate of the season's output, but it may be safely stated that the total collections for 1919 will, in all probability, exceed those of last year and be the largest on record.

The following return shows the yield of guano and the quantities actually brought up to Cape Town, from the various islands and rocks under my control, during the calendar year 1918, as compared with the previous year:—

Island.	Collected.		Shipped to Cape Town.	
	1917.	1918.	1917.	1918.
	Tons.	Tons.	Tons.	Tons.
Colonial Group.				
Malagas Island	1,024¼	1,058¼	1,024¼	933½
Dyers ,, ...	331¼	665¼	331¼	665¼
Jutten Island	255¼	430	255¼	430
Dassen ,, ...	124½	257¼	124½	257¼
Lambert's Bay Island	274½	220¾	274½	220¾
Bird ,, ...	200 *	217¾*	Nil	337
Paternoster Island..	91¼	44¼	40¼	66¾
Seal Island	28¾	27½	28¾	27½
Elephant Rock	30¼*	20	15	20¾
Foundlings Island	17½	Nil	17½	Nil
Marcus Island	Nil	Nil	Nil	Nil
Totals	2,377½	2,941	2,111¼	2,959½
Northern Group.				
Ichaboe Island	2,167½	3,122	2,567½	2,977½
Possession ,, ...	1,022¾	900	1,254¾	659½
Halifax Island	370¼	325	Nil	630
Mercury ,, ...	220	324½	363	324½
Penguin and Seal Islands	548½	140	548½	Nil
Pomona Island	109	105	209	105
Sinclairs ,, ...	100	84	200	84
Plumpudding Island	50	70	100	70
Hollamsbird ,, ...	Nil	Nil	Nil	Nil
Totals	4,588	5,070½	5,242¾	4,850½
Grand Totals	6,965½	8,011½	7,354	7,810

* Roughly estimated.

The reserve stock of guano (being the balance left over of the 1918 crop) on hand on the 31st December last was approximately 4,446 tons, of which quantity about 1,662 tons were still remaining on the islands on that date. The whole of this quantity was thrown into the first allotment of 1919 and disposed of before the end of March of that year.

Demand for and Distribution of Guano.—Notwithstanding the fact that its distribution during 1918 was restricted to the growing of cereals (including maize) and potatoes only, the demand for guano this year was very nearly double that applied for, for all purposes, in 1917. There was a notable increase in the demand from the districts of Malmesbury, Caledon, Bredasdorp, Tulbagh, Clanwilliam and Swellendam, as well as from some of the other centres.

The demand from localities, outside of the limits of the Western and South Western Districts of the Cape Province, however, remains comparatively very small, whilst there has also been a further shrinkage in the area of distribution as compared with previous years.

The total quantity of guano applied for during 1918 (including applications from other Government Departments), was 548,647 bags (54.864¾ tons) and the actual quantity disposed of in the same period was 7,060½ tons, 94.24 per cent. of which was absorbed by the Western and South Western Districts of the Cape Province and, of that quantity, 6,028½ tons were distributed between the Malmesbury, Caledon, Paarl, Bredasdorp, Stellenbosch, Cape and Tulbagh Divisions alone.

The following statements show the quantities of guano sold and distributed to various centres in the Union during 1918, as compared with the year 1917:—

District	Year.		District.	Year.	
	1917.	1918		1917.	1918
	Bags.	Bags.		Bags.	Bags.
Malmesbury	13,648	17,719	Riversdale	10	16
Caledon	8,989	13,538	Alexandria	5	8
Paarl	13,234	8,621	Mafeking	1	5
Bredasdorp	2,277	7,046	Aliwal North	5	3
Stellenbosch	8,392	5,720	Cradock	—	2
Cape	9,883	4,272	East London	35	—
Tulbagh	2,065	3,369	Albany	19	—
Clanwilliam	444	1,861	Transkei	17	—
Swellendam	501	1,561	Oudtshoorn	15	—
Piquetberg	2 273	1,361	Barkly West	11	—
Worcester	1,069	750	Fort Beaufort	10	—
Ceres	703	551	Laingsburg	10	—
Mossel Bay	104	211	Beaufort West	8	—
Robertson	87	164	Queenstown	3	—
Port Elizabeth	91	160	Humansdorp	2	—
*Knysna	109	87	Prieska	1	—
King William's Town ..	55	38	*Transvaal*	1,680	2,151
Stutterheim	10	31	*Natal*	651	1,095
Griqualand East	30	29	*Orange Free State*	135	186
George	26	29	†*Rhodesia*	1	—
Cathcart	—	20			
			Totals, Bags ..	66,609	70,604
			Totals, Tons ..	6,661	7,060½

* Sold through the medium of the Guano depot at Knysna, which is still being continued.

† Supplied to the Agricultural Department for experimental purposes.

Summary of Distribution.

	1917. Tons.		1918. Tons.	
Cape Province				
Western and South-Western Districts ...	6,356½		6,653½	
Other Districts	57¾		64	
		6,414¼		6,717½
Transvaal, all Districts	168		215	
Natal, all Districts	65¼		109½	
Orange Free State, all Districts	13½		18½	
		246¾		343
Totals ...		6,661		7,060½

Analytical Composition of Guano.—The average analytical composition of the several stocks of guano disposed of during the year 1918 was as under:—

Nitrogen, 10·96 per cent.; Phosphoric Oxide Soluble in Water, 3·17 per cent.; Phosphoric Oxide Soluble in Citrate Solution, 10·16 per cent.; Total Phosphoric Oxide, 10·84 per cent.; Potash, 1·78 per cent.; Lime, 10·92 per cent.

Sale of Penguin Eggs.—The collection of penguin eggs is still being restricted to Dassen Island only. The total number of eggs collected by the contractors from that island, during the season, 1918, was 546,300, from which a revenue of £2,845 6s. 3d. was derived.

Sealing.—The demand for fur-skins in London still continues good and excellent prices were obtained for the seal skins shipped to England during the year.

Sealing operations were undertaken on the West Coast during the winter season of 1918 and, notwithstanding the very unfavourable weather encountered in the earlier stages of the enterprise, very satisfactory results were attained.

No sealing was, however, carried out on Dyers Island, on the South Coast, as it was not thought advisable to disturb the seals on that island during that season.

The total season's catch was 7,143 skins, of which 902 were procured from Elephant Rock and 6,241 from the islands and rocks on the South West African Coast.

Owing to the difficulty of obtaining freight space, it was not found possible to ship any of these skins to London before the 24th December last, when a consignment of 6,961, including a small balance of 204 skins,—the balance of the previous season's catch—were despatched to the Trades Commissioner for disposal. These skins were not sold until the 27th March, 1919, when a total sum of £20,179 12s. 8d. was realised, being an average of £2 17s. 11¾d. per skin.

A small balance of last season's catch (viz.:—386 skins from Elephant Rock) which have since been received from the Coast are still on hand, awaiting a suitable opportunity for shipment to London.

Seal Oil.—In addition to the seal skins, 3,492 gallons of seal oil were secured during the season's operations, of which a large proportion has already been disposed of at very good prices. The revenue derived from the sale of seal oil during 1918 realised the sum of £1,191 18s. 6d.

In conclusion, I desire to keep before the notice of the Government the pressing need for a departmentally-controlled steamer for the more economical and expeditious working of the guano industry and I trust, now that the war is over, the opportunity for considering the acquisition of a suitable vessel for the guano islands service will not be long delayed.

Owing to the entire absence of competition on the South African Coast, most exorbitant rates of freight are being demanded and have to be paid for the conveyance of the men and stores, etc., to and the guano from the various islands and I feel confident that a large saving in the working costs of the guano undertaking, on this item alone, would be effected by a Government-owned steamer for the work in question.

The total amount spent on freight, during the last two financial years, was over £12,000 per annum, being an increase of 91·2 per cent. on the average annual expenditure incurred on this service during the four years immediately preceding the war.

W. R. ZEEDERBERG,

Superintendent, Government Guano Islands.

ANNEXURE.—GOVERNMENT GUANO ISLANDS.

(*a*) CAPITAL ACCOUNT FOR THE YEAR ENDING 31ST MARCH, 1919.

Stock on hand on 1st April, 1918.	£	s.	d.	£	s.	d.
Balance 1st April, 1918:						
General Plant	493	8	9			
Houses, Piers and other Structures	4,697	14	2			
Boats	458	13	8			
				5,649	16	7
Expenditure, 1918-19:						
General Plant	286	4	3			
Houses, Piers and other Structures	116	15	1			
Boats	169	17	6			
				572	16	10
Adjusting entry in respect of boats, etc., a/c:						
Ascertained Value	2,105	0	0			
Book Value	628	11	2			
				1,476	8	10
				£7,699	2	3

Receipt for year 1918-1919. By:—	£	s.	d.	£	s.	d.
Depreciation as per Profit and Loss Account				636	13	9
Balance as at 31/3/19:						
General Plant				583	17	11
Houses, Piers and other Structures				4,373	10	7
Boats				2,105	0	0
				£7,699	2	3

(*b*) WORKING ACCOUNT FOR YEAR ENDING 31ST MARCH, 1919.

Stock on hand on 1st April, 1918:	£	s.	d.	£	s.	d.
Value of Guano	14,475	6	0			
Sealskins	102	0	0			
Seal Oil and Shark Oil	215	12	6			
Provisions	2,389	3	0			
				17,182	1	6
Administrative Charges:						
Salaries and Allowances	5,386	6	4			
Transport and Travelling	192	6	5			
				5,578	12	9
Working Charges:						
Wages	6,145	3	5			
Provisions and Water	9.047	19	6			
Material, Plant & other Supplies	1,914	3	6			
Freight	11,821	13	3			
Landing and Delivery	4,161	16	9			
Bags	10,479	15	1			
Collection of Guano on Smaller Islands & Rocks	295	5	3			
Miscellaneous	4,636	2	2			
	48,501	18	11			
Less Expenditure charged to Capital Account	572	16	10			
				47,929	2	1
Printing and Stationery				112	6	0
Balance to Profit and Loss Account				71,019	2	3
				£141,821	4	7

	£	s.	d.	£	s.	d.
Receipts for year 1918-19:						
Sales of Guano	89,487	0	0			
Sales of Riddlings	1,554	19	6			
Sales of Penguin Eggs	3,014	1	3			
Sales of Seal Oil	715	11	0			
Sales of Seal Skins	6,742	0	6			
Miscellaneous Receipts	93	15	0			
	101,607	7	3			
Less value of Seal Skins shown as in transit in 1917-'18 accounts	5,704	4	0			
				95,903	3	3
Value of Seal Skins in transit to London				19.393	10	5
Value of Guano supplied as Free Issues				1,050	0	0
Stock on hand, 31/3/19:						
Guano	22,014	6	0			
Seal Skins	193	0	0			
Seal Oil and Shark Oil	430	5	0			
Provisions, etc.	2,836	19	11			
				25,474	0	11
				£141,821	4	7

(*c*) PROFIT AND LOSS ACCOUNT FOR THE YEAR ENDING 31ST MARCH, 1919.

To:—	£	s.	d.	£	s.	d.
Depreciation:						
General Plant	195	15	1			
Houses Piors, etc.	440	18	8			
				636	13	9
Balance being Net Profit for year				70,382	8	6
				£71.019	2	3

By:—	£	s.	d
Balance from Working Account	71,019	2	3
	£71,019	2	3

(*d*) BALANCE SHEET AS AT 31ST MARCH, 1919.

Liabilities.	£	s.	d.	£	s.	d.
Sundry Creditors:						
Wages	2,267	6	0			
Other Accounts	1,370	8	11			
				3,637	14	11
Capital Account				28,899	4	6
				£32,536	19	5

Assets.				£	s.	d.
General Plant	583	17	11			
Houses, Piers and other Structures	4,373	10	7			
Boats	2,105	0	0			
Stock Account	25,474	10	11			
				32,536	19	5
				£32,536	19	5

APPENDIX XV.

CHIEF INSPECTOR OF GRAIN.

Following upon the lines of previous reports, I have to state that the 1918 maize crop was a fairly good one and if it were not for adverse climatic conditions would undoubtedly have been a very heavy crop, the acreage under cultivation being about the same as in the previous season; owing, however, to unfavourable weather conditions which prevailed the actual yield showed a decrease of from 10 per cent. to 20 per cent. of the estimated normal crop for the whole of the Union.

In the Transvaal excessive rains prevented extended cultivation during the first part of the season and the sodden state of the lands rendered ploughing difficult and the wet weather also greatly retarded the growth of the standing crops. Severe frosts were experienced in most parts during June, 1918, which caused considerable damage to the maize planted late in the season. In the Rustenburg district, however, the crop was in an excellent condition and was consequently a little above the normal yield, while in the Heidelberg and Bethal districts (two good maize producing centres), the crop was disappointing and fell considerably below normal. Fortunately in the Potchefstroom district, which is considered one of the principal maize producing areas of the Union, the crop was only a few points below normal, while in the Western Transvaal the crop was very satisfactory, it being estimated that the yield was on an average about 5 per cent. above normal.

In the Low Veld districts, the crop was about 15 per cent. below normal.

In portions of the Orange Free State, only about 3/4ths of the ordinary crop was obtained, but in the North-Western districts the crop was good, especially in the Kroonstad district, the yield being slightly above normal.

In Natal the crop was a very poor one, due to severe frosts, etc., being experienced over a wide area which resulted in the crop being about 37 per cent. below normal for the whole Province.

In the Cape Province, the crop was approximately 28 per cent. below normal.

In view of the above the total crop for the Union was placed at approximately nine million six hundred thousand bags (9,600,000), which gave an estimated surplus above the country's ordinary requirements of 2,000,000 bags. It was estimated, however, that an additional quantity of 500,000 bags would be required for local consumption, *i.e.* for mixing with wheat flour in terms of the Wheat Conservation Act, 1918, so that the surplus of the Union's 1918 maize crop available for export was placed at approximately 1,500,000 bags. Owing, however, to unusual and very heavy rains which fell in the Transvaal during August, 1918, considerable damage was caused to maize still on the lands and stacked at Railway Sidings, etc.; it is estimated that about 200,000 bags of maize was thus damaged, which reduced the estimated quantity available for export to 1,300,000 bags, but on account of the withdrawal of the above Act from the 1st February, 1919, it was estimated that about 275,000 bags (out of the 500,000 bags originally earmarked for the purposes of this Act) again became available, making the estimated total quantity available for export approximately 1,600,000 bags. From the returns of maize and maize meal of the 1918 crop actually exported to date and subsequent information obtained regarding the maize stocks still in the country, it appears, however, that the quantity available for export was considerably under-estimated, as considerably more than the estimated quantity of maize has been exported, while from information obtained it appears that there are still at this date about 1,000,000 bags available in the country.

From information obtained from the Trades' Commissioner for the Union of South Africa in London, it appears that the prices realised for our maize on the English markets, which were throughout controlled by the Imperial Government, remained at the same figure from the beginning of January, 1918, to July, 1918, during which period the best grade, *i.e.*, No. 1 white flat, was offered at 81s. per quarter of 480 lbs. c.i.f., and the other grades at proportionately lower prices down to 74s. 6d. per quarter for the lowest grade (No. 8) or below grade.

In the beginning of July a change took place, when prices were increased by 14s. per quarter, bringing the selling price for No. 1 flat white up to 95s. per quarter and the (No. 8) no grade to 88s. 6d. But by the beginning of January, 1919, the prices again dropped by about 18s. per quarter, viz.:—

Nos. 1, 2 and 3 (white flat) 77s. per quarter c.i.f.
Nos. 4, 5 and 6, 75s. per quarter c.i.f.
Nos. 7 and 8 (mixed and below grade) 73s. per quarter c.i.f.

At about that time the rates of freight were reduced and this undoubtedly largely accounted for the lower c.i.f. offers. From the latest cable information received prices for our best grades of maize have fallen to 65s. per quarter.

These prices resulted in from 13s. 6d. to 15s. per bag being paid for the maize delivered at stations in the Union.

Returns showing in detail the quantities of the various kinds of grain exported from the Union, during the period 1st April, 1918, to 31st March, 1919, giving the Provinces of origin, the ports through which sent and its destination, are attached. From these returns it will be seen that the following quantities of maize and its by-products and other cereals were handled by the Graders of the Division during the period under review, viz.:—For export oversea, 1,549,680 bags of maize, 975,603 bags of maize meal, 28,376 bags hominy chop, 157,689 bags of oats, 883 bags of barley, 4,730 bags of kaffir corn, 5,912 bags lucerne seed, 3,970 bags of beans, 12,983 bags of peas, as against 3,293,408 bags of maize, 798,883 bags of maize meal, 29,194 bags of hominy chop, 117,293 bags of oats, 7,384 bags of barley, 2,769 bags of kaffir corn, nil bags of lucerne seed, 1,119 bags of beans, 3,258 bags of peas for the twelve months ended 31st March, 1918.

From particulars supplied by the Defence Department, the following quantities of grain, etc., were exported from the Union for military purposes to the South-West Protectorate and to German East Africa, in addition to those mentioned above, viz.:—Maize, 26,600 bags; crushed maize, 11,111 bags; maize meal, 138,856 bags; oats, 16,267 bags; lucerne (baled), 2,763 tons; teff, 62 tons.

I am pleased to be able to record that the rejection of grain for unsoundness or inferior quality has not been so heavy as in the previous year, only 56,761 bags having been rejected as against 263,293 bags last season; the principal cause for rejection was weevils and mustiness.

It will be observed from the returns that there was a considerable increase in the quantities of dried peas and beans exported and it appears, therefore, that a good export trade is being established oversea in these commodities.

Bags.—Approximately 14,871 bags of grain had to be rebagged at the Ports of shipment, owing to the bags being too old and patched to carry grain for export purposes. The number of "re-bags" would undoubtedly have been much greater had the Graders not been instructed to use their discretion in the rejection of bags and allow those which in their opinion were sufficiently strong to carry the grain to its destination. This instruction was given owing to the scarcity of bags and the high prices charged for them on account of the war.

I am pleased to state that from enquiries made it appears that the position regarding the supply of grain bags is greatly relieved since the cessation of hostilities; no difficulty is apparently now being experienced in obtaining bags either as regards freight or supplies from India. In fact it appears that grain bags can be purchased at a cheaper rate in the Union to-day than they can be obtained in India, due presumably to the fact that large stocks were imported by merchants and others for speculative purposes and which they are now endeavouring to dispose of for fear that the prices will drop still lower in the immediate future. The present prices of bags in this country are: 1s. 3d. each for the "A" twill and 1s. 2d. for the "B" twill bag f.o.r. Durban.

Oats.—The 1918/19 crop was a fairly heavy one, especially in the Western Province of the Cape and from the above figures it will be observed that 173,549 bags were exported from the Union during the period under review, including the quantity exported by the Defence Department for military purposes.

At the last Maize Conference the grades for oats for export purposes described in item 12 of the Summary of Resolutions adopted thereat (copy of which is appended) and suggested by the Department were agreed to, and a notice embodying such grades was duly published for general information and the necessary arrangements had been made by the Division to enforce them, but as the result of representations made by influential exporters of oats, storekeepers and farmers it was decided to suspend the proposed new regulations governing the export of oats until further notice; the matter will again be brought up at the next Conference for discussion.

Kaffir Corn.—It will be seen from the above figures that there has been an increase of about 2,000 bags in the quantity exported during 1918-'19 as compared with the previous year. It is very difficult to obtain reliable figures regarding the available quantity of this cereal as it is principally grown by the native and it is impossible, therefore, to get any reliable information as to the quantities reaped, due to the fact that natives hardly ever "bag" their grain, but they store it in pits and in large baskets.

Barley.—There has been a considerable decrease in the quantity of this cereal exported during the period under review as compared with the previous year.

Complaints.—No complaints were received during the period under review regarding the grading at the ports of shipment, but a few complaints were received regarding the grading of maize for milling in transit, but upon investigation it appeared that the Grader was justified in his decision.

Inland Grading.—Three Inland Graders were employed during the season. Their headquarters were at Kroonstad, O.F.S., Klerksdorp and Coligny (Lichtenburg), respectively, and 165,494 bags of grain were graded by them during the period. I regret to state, however, that several complaints were made regarding the inland grading of some of the grades, and unfortunately, it was ascertained, upon investigation, that most of the complaints were well founded, it being found that the graders concerned did not exercise sufficient care in the performance of their duty. It should be borne in mind, however, that it is a difficult matter to get competent graders as it is only after years or experience that a grader becomes really efficient in this kind of work, as is evidenced by the fact that all the Inland Graders were sent to the Coast for a course of training before they were entrusted with the work, but notwithstanding this fact they made the mistakes referred to above. The services of one of the Inland Graders have since been dispensed with owing to unsatisfactory discharge of his duties.

Annual Maize Conference.—The 1918 Maize Conference was held in the Union Buildings, Pretoria, on the 9th August, 1918, under the auspices of the Agricultural Department and was attended by representatives of the Association of the Chambers of Commerce of South Africa, the different Agricultural Unions, the Central Agency for Co-operative Societies, the Union Castle Steamship Company and Conference Lines, and the South African Railways. It was resolved at the Conference that, as subjects other than maize are submitted for discussion, the Conference will in future be called "The Annual Grain Conference". A summary of the resolutions adopted at the Conference, detailing the action taken and the decision arrived at thereon, is appended:—

1. That consignees shall be allowed 24 hours within which to unload consignments before demurrage charges become operative, instead of 12 hours as at present happens to be the case.

Reply:—The Railway Administration advises:—

> At the present time the Administration is suffering from an acute shortage of rolling stock and it is, therefore, essential in the general public interest that delays to rolling stock should be obviated as far as practicable. The experience of the Administration indicates that any extension of the free period allowed for loading and unloading trucks, would conduce to increased delays in those operations and in these circumstances it will be appreciated that the Administration cannot agree, under existing conditions, to accede to the request put forward in the above resolution.

2. That the frequent loss of grain and meal in transit being a source of much annoyance and financial loss to farmers and merchants, this Conference recommends that the Administration should accept responsibility for numerical shortages and that a uniform rate to cover all charges be levied.

Reply:—The Railway Administration states:—

> The greater proportion of the export maize and meal traffic is loaded by senders and much of the traffic is despatched from private sites and sidings. In the latter case it is not practicable for the Administration to check the traffic, except by incurring considerable additional expense in allocating checkers to superintend and check loading operations at private sites and sidings. Even in respect of grain loaded by senders at stations where there is a resident staff, much extra expense would be involved if the Administration were to check the traffic. Export grain is charged at an exceptionally low rate and it will be realised that it is not possible for the Administration to incur the expense of checking this traffic unless the service is charged for at a tariff over and above the export rate. It is also certain that the expense which would be involved in checking the whole of the export grain traffic would materially outweigh any saving which might be effected in avoiding losses of grain in transit, so that the proposed change would not be in the interests of the grain industry which must in the long run be responsible for the whole of the charges involved in the transportation of the grain.
>
> It was suggested at the Annual Maize Conference by the trade representatives that a uniform charge should be added to the export grain rate and that the Administration should take all responsibility for numerical shortages. The farming representatives at the Conference, however, indicated that they were not in favour of the proposal as the extra charge would actually be paid by the farmer. The Railway representatives at the Conference also pointed out that, as it was impracticable for the Administration to check more than a small proportion of the traffic, there were decided objections to the Administration paying claims for alleged shortages as this would encourage dishonesty.

After reviewing all the circumstances, therefore, the Administration is not prepared to adopt the proposal contained in the resolution; but all possible steps will be taken to locate the responsibility for shortages and it will assist the Administration in taking action to minimise shortages if the members of the trade concerned will report promptly to the Administration any instances where an undue proportion of shortages occurs.

3. That the Railway Authorities shall accept all responsibility for damage to grain in transit.

Reply:—The Railway Administration states:—

In view of the low rate charged for the conveyance of export maize, the Administration is not prepared to accept responsibility for damage to grain in transit, unless the alternative railway risk is paid. On receipt, however, of any complaints of specific cases of damage, a full investigation will be made with a view to minimising such cases. It may be mentioned that when more normal conditions supervene, it is anticipated that increased supplies of railway tarpaulins will be available which should cause a diminution of the number of instances of damage by wet.

4. That, in the opinion of this meeting, arrangements should be made for the pooling and stacking of grain at ports.

Reply:—The Railway Administration states:—

As stated at the Conference by the Railway Representatives, the system of pooling and stacking of grain at the ports has been in operation for many months past.

5. That this Conference is strongly of opinion that at least fourteen days free storage should be given for rejects, or, failing this, the storage charges should be at export rate.

Reply:—The Railway Administration states:—

The Railway Administration has suffered considerable inconvenience in the past through harbour space being congested with rejected grain and it is informed that at one time there were over 32,000 bags of rejected grain on hand at the ports. It is necessary to enable the Administration promptly to deal with the export grain business, that available accommodation should not be congested with rejected grain and the sole object of the present higher storage tariffs on such grain is to stimulate its prompt removal from the harbour sheds. It was noted at the Conference that one of the principal farming representatives was decidedly opposed to any relaxation of the higher charges payable on rejected grain, and it may be mentioned that certain of the Administration's officers considered that the present storage charges thereon should be increased. In these circumstances, the Administration is unable to consider any question of reducing the storage charges or extending the free period allowed for the removal of rejected grain.

6. This Conference recommends that a regulation be introduced by the Railway Administration to the effect that white maize be not mixed in the same truck as yellow maize, provided that the regulation be relaxed where a farmer has insufficient maize of one colour to make up a full truck load.

Reply:—The Railway Administration states:—

The Administration is favourably disposed to the adoption of the above recommendation and enquiries are being made with a view to the necessary action being taken.

7. That this Conference approves of the present Railway system of permits, both as regards maize for export and milling in transit traffic.

Reply:—The Railway Administration advises that the matter has been noted.

8. That the Agricultural Department be requested to circularise farmers and agricultural societies, that their members should see that trucks are clean before loading the grain.

Reply:—This has been done.

9. While realising that the present system of itinerant inland graders is not satisfactory, this Conference considers that they should be retained until such time as a better system can be devised, and asks that thoroughly qualified graders shall be available to settle disputes between buyers and sellers in inland centres.

Reply:—This resolution is being given effect to.

10. That no alterations be made in the standard grades of maize and that the existing classification shall remain operative until occasion may arise to create new grades to meet the demands of consumers.

Reply:—The Department has no intention of making any change in the existing grades for maize.

11. That all maize for export shall be regraded at the port and that the Government grader's certificate, issued at the port, must in all cases be final.

Reply:—This has been given effect to and the Inland Grading Regulations amended accordingly.

12. That the following grades for oats, suggested by the Department of Agriculture. be adopted:—

Cape Western Province Grades.

No. 1. To be sound, plump, well grown oats, free from admixture of any kind and to weigh not less than 38 lbs. per bushel;

No. 2. To be sound, well grown, containing not more than 5 per cent. foreign matter and foul seeds, and to weigh not less than 36 lbs. per bushel;

No. 3. No grade, to be sound, not to contain more than 10 per cent. foreign matter or foul seed, and weight not to be less than 32 lbs. per bushel.

Orange Free State Grades—Oats to be Described as "Orangia Mixed".

No. 1. To consist of any one or all varieties mixed in one consignment. To be well grown, reasonably clean and free from impurities and foul seeds. To weigh not less than 36 lbs. per bushel;

No. 2. To consist of any one or all varieties mixed in one consignment, well grown, not to contain more than 5 per cent. of impurities and foul seeds, and not to weigh less than 33 lbs. per bushel.

No. 3. No grade, to consist of any one or all of the varieties mixed in one consignment, sound, not to contain more than 10 per cent. of impurities and foul seeds and not to weigh less than 28 lbs. per bushel.

Reply:—These grades have now been adopted and a notice embodying them has been published for general information.

13. That in the true interests of farmers and the trade generally, standard samples of wheat, mealie meal, rye and oats, should be at once provided and numbered numerically as is done in the case of maize and already suggested in regard to oats.

Reply:—This matter is receiving attention.

14. That it be a recommendation that inasmuch as subjects other than "maize" are annually submitted for discussion, the name be altered to "The Annual Grain Conference".

Reply:—This has been adopted and will be acted upon in future.

15. That the Conference urge the necessity for the erection of grain elevators at convenient centres and that the work be taken in hand without delay, thus promoting the extension of our maize production which is rapidly becoming one of our main farming industries.

Reply:—The Railway Administration advises:—

This resolution has been noted and steps have already been taken to secure, as early as possible, the services of a Consulting Engineer having expert knowledge of elevators, to study South African conditions on the spot and thereafter draw up plans and specifications for elevators.

16. That the Government be asked to provide delegates to the Annual Grain Conference with a subsistence allowance while travelling for the purpose of attending the Conference.

Reply:—The Treasury advises that after full and careful consideration of the matter it regrets being unable to accede to the request.

17. The recommendation of the Conference that arrangements be made that the Maize Reports should not be sent in before the 30th September, for the next Census was communicated to the Director of Census, who advises as follows:—

> "That Statistical Council has adopted the 30th April in each year as being the most workable date for the collection of the Annual Agricultural and Pastoral Statistics, and I think you will agree that taking all circumstances into consideration, it is about the most convenient time.
>
> "As you are aware, in the Form of Return which is to be used next year for the collection of these statistics, provision has been made in so far as mealies and kaffir corn are concerned for a return of the 1918 harvest and for an estimate of the 1919 crop, and it is trusted that this will meet the requirements of the Maize Conference. According to information received in this office during last year's Census of Machine Threshed Maize, large quantities of maize were being threshed up to as late as November and December last."

Staff.—Mr. W. Pyott, Inspector of Grain of this Division, resigned his post on the 31st March, 1919, and Mr. F. A. C. Stewein, the Government Grader at Cape Town, has been appointed in his place. No other changes took place.

Mr. G. F. Nussey, the Chief Inspector of Grain, is still seconded to the Defence Department.

General.—The expenditure in connection with the Division for the financial year 1918-'19 was £6,846 19s. 8d.; the Revenue for the same period, £6,144 17s. 4d.

In conclusion I wish to avail myself of this opportunity to tender my thanks to the Railway and Harbour Officials, for the ready assistance always given to the graders and other officers of this Division in the execution of their duties.

MELT van NIEKERK,
Acting Chief Inspector of Grain.

ANNEXURE A.

South African Graded Maize Exports for Year ended March 31st, 1919

Amounts in Bags.

Month.	Cape Town.	Durban.	Port Elizabeth.	East London.	Mossel Bay.	Lourenco Marques.	Total.
1918							
April	199,710	125,740	10,962	49,949	—	—	386,361
May	44,114	70,185	—	—	—	11,688	125,987
June	1,761	—	—	—	6,461	6,600	14,822
July	26,803	45,154	5,931	—	—	5,015	79,903
August	7,751	—	—	—	—	12,174	19,925
September	8,729	1,056	—	11,200	—	—	20,985
October	65,107	37,485	—	41,050	—	14,292	157,934
November	67,500	17,370	53,399	35,000	—	24,000	197,269
December	91,239	55,926	69,682	73,437	—	26,850	317,134
1919							
January	29,219	38,038	17,945	—	—	—	85,202
February	21,538	26,465	—	—	—	5,372	53,375
March	35,073	24,492	—	20,218	—	11,000	90,783
	598,544	438,911	157,919	230,854	6,461	116,991	1,549,680

ANNEXURE B.

Destination Graded Maize Exports for Year ended March 31st, 1919.

Destination.	Cape Town.	Durban.	Port Elizabeth.	East London.	Mossel Bay.	Lourenco Marques.	Total.
United Kingdom	553,279	—	146,957	11,200	—	—	711,426
Madeira	1,761	—	—	—	—	6,355	8,116
Portugal	—	—	—	—	—	99,048	99,048
Australia	43,504	—	—	—	—	—	43,504
East Africa	—	—	—	—	—	4,988	4,988
Spain	—	—	—	—	—	6,600	6,600
Unknown	—	438,911	10,962	219,654	6,461	—	675,998
	598,544	438,911	157,919	230,854	6,461	116,991	1,549,680

ANNEXURE C.

Maize Rejected during the Year ended March 31st, 1919.

1918-19.	Cape Town.	Durban.	Port Elizabeth.	East London.	Mossel Bay.	Delagoa Bay.	Grand Total.
Weevily	7,271	3,980	2,228	375	—	64	13,918
Musty	13,342	9,479	963	488	—	3,315	27,587
Wet	1,593	5,975	1,514	374	—	4,307	13,763
Other Causes	245	302	923	23	—	—	1,493
	22,451	19,736	5,628	1,260	—	7,686	56,761

ANNEXURE D.

Various Shipped during Year ended March 31st, 1919.

Crops.	Cape Town.	Port Elizabeth.	Durban.	East London.	Mossel Bay.	Delagoa Bay.	Total.
Oats	152,448	—	114	5,127	—	—	157,689
Chop	—	—	28,376	—	—	—	28,376
Kafir Corn	4,730	—	—	—	—	—	4,730
Meal (Maize)	287,724	—	637,055	50,824	—	—	975,603
Peas	12,983	—	—	—	—	—	12,983
Beans	3,970	—	—	—	—	—	3,970
Barley	—	883	—	—	—	—	883
Lucerne Seed	5,912	—	—	—	—	—	5,912
	467,767	883	665,545	55,951	—	—	1,190,146

ANNEXURE E.

Summary of Grades Shipped.

Grades.	Cape Town.	Durban.	Port Elizabeth.	East London.	Mossel Bay.	Delagoa Bay.	Total.
1. F.W...	—	—	—	—	—	7	7
2. ,, ...	47,352	27,950	11,537	13,299	206	79,736	180,080
3. ,, ...	11,035	21,362	6,672	16,330	775	25,800	82,274
4. F.Y.	113,728	37,972	59,304	51,676	481	2,108	264,569
5. R.W.	7,828	1,889	124	4,728	184	83	14,856
6. R.W.	319,663	262,443	62,319	124,807	2,809	10,007	782,228
7. Mixed	18,110	4,654	949	4,625	249	53	28,640
8. No. Grade:	80,828	82,641	17,014	14,789	1,877	197	197,046
	598,544	438,911	157,919	230,854	6,461	116,991	1,549,680

ANNEXURE F.

DESTINATION OF VARIOUS GRAIN SHIPPED.

	Lucerne Seed.	Oats.	Hominy Chop.	Meal.	Kaffir Corn.	Peas.	Beans.
United Kingdom ..	—	125,195	—	381,035	4,731	12,946	776
Mauritius	—	19,553	—	—	—	—	—
Australia	1,532	3,750	—	—	—	—	—
Argentine	3,316	—	—	—	—	—	—
Unknown	1,064	9,191	28,376	594,568	—	37	7

ANNEXURE G.

SOUTH AFRICAN GRADED MAIZE EXPORTS, YEAR ENDED 31ST MARCH, 1919.

Provinces of Origin.

	Transvaal.	O.F.S.	Natal.	Cape.	Total
1. F.W.	7	—	—	—	7
2. ,, ...	100,748	78,635	695	—	180,078
3. ,, ...	61,346	20,059	869	2	82,276
4. F.Y.	154,252	108,177	1,349	791	264,569
5. R.W.	5,237	9,426	76	97	14,836
6. R.Y.	176,049	402,831	2,815	533	782,228
7. M.	8,377	18,328	217	1,718	28,640
8. No. Grade ..	61,923	127,586	7,348	189	197,046
	567,939	965,042	13,369	3,330	1,549,680

APPENDIX XVI.

CONTROLLER OF FENCING AND REGISTRAR OF BRANDS.

During the period 1st April, 1918, to 31st March, 1919, 550 additional Brands were registered in the Transvaal Province, 89 in the Cape and 31 in the Orange Free State (there is no Brands Act in force in Natal), 669 branding irons were supplied during the period under review against prepayment.

£191 5s. 3d., was collected for registration fees and £435 3s., for branding irons supplied at cost price.

The number of brands registered in each Province to the 31st March, 1919, is as follows:—Transvaal, 20,900; Orange Free State, 1,560; Cape, 5,736; total for the three Provinces, 28,196.

Brands Directories.—Owing to scarcity of paper as a result of the war, the usual Transvaal Annual Brands Directory for 1918, was not published, but a list showing the additions, amendments thereto and cancellation of Brands during 1918, is being issued instead thereof.

Quarterly returns showing the brands issued from time to time in the three Provinces mentioned, during the period stated, were prepared and published regularly.

The 1918 addition to the Orange Free State Brands Directory, was not published for the reasons stated above, but a list showing the Brands registered during 1918, is being issued in place thereof.

The Branding of Stock, and especially in accordance with the provisions of the Transvaal Brands Ordinance (No. 15 of 1904), is undoubtedly a very important factor in the furtherance of the cattle farming industry of this country, and I would, therefore, again strongly urge that, for the reasons given in my previous report, the provisions of the Ordinance mentioned be extended to the other three Provinces at the earliest opportunity.

Fencing.—42 applications for advances under the Fencing Act No. 17 of 1912, were dealt with during the period under review. The prices for fencing materials, although slightly lower now than when I wrote my previous report, are still exorbitant and that accounts for the small number of applications received by the Land Bank for fencing advances.

A considerable number of queries, in connection with fencing charges under Ordinance No. 38 of 1904 (East Coast Fever Ordinance), were dealt with during the period under notice and disposed of.

Dipping Tanks.—108 applications for advances under the provisions of the Dipping Tank (Advances) Act No. 20 of 1911, were examined and dealt with by this Division during the period 1st April, 1918, to 31st March, 1919.

MELT VAN NIEKERK,

Acting Controller of Fencing and Registrar of Brands.

APPENDIX XVII.

STATEMENT OF IMPORTS.

Statement showing the total value and quantity of Importations from Oversea of certain Animals, Products of the land and articles mainly for Agricultural Purposes, during the calendar years 1913 (prior to the War), 1917 and 1918.

IMPORTS.

Produce or Article.	1913.		1917.		1918.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
‡ANIMALS, LIVING.	No.	£	No.	£	No.	£
Bulls and Oxen	745	40,402	229	16,816	207	20,961
Cows and Calves	1,443	53,152	304	16,345	475	32,568
Donkeys and Jackasses	140	9,953	15	1,500	18	1,800
Horses, Mares and Geldings ..	836	41,472	155	12,114	159	15,295
Mules	3,938	68,485	—	—	—	—
Goats	2	27	—	—	—	—
Pigs	64	697	7	97	5	115
Sheep and Lambs	6,168	42,552	483	8,015	149	9,141
Poultry	2,925	2,704	301	442	233	501
	16,261	259,444	1,494	55,329	1,246	80,381
FOOD AND DRINK, AND MISCELLANEOUS.						
(a) *Agricultural Produce :*	lbs.		lbs.		lbs.	
Beans and Peas	14,524,199	71,613	7,724,655	36,101	958,965	9,344
Dholl	6,374,795	24,492	5,823,569	27,247	4,559,497	25,557
Flour, Wheaten & Wheaten Meal	169,770,021	742,781	53,763,956	402,683	23,598,271	209,667
Maize	33,961,231	91,455	448,280	1,115	44,836	196
Malt	11,501,433	87,405	4,952,416	58,161	1,181,375	15,083
Oats	640,533	2,540	6,841	54	23,884	160
Wheat	321,517,169	1,060,346	155,159,889	801,822	75,414,159	444,620
Oatmeal	5,992,706	53,878	3,019,685	38,050	285,998	3,474
Fruit, Fresh, (including Nuts*)†	1,813,720	78,724	917,897*	16,498	1,599,500*	41,544
Fruit, Dried, Preserves & Dates	6,164,343	76,575	1,910,846	46,679	1,592,574	33,580
Rice	90,243,102	443,033	81,408,730	410,378	76,939,758	451,176
Sugar and Sugar Products ..	75,786,670	492,905	28,406,742	197,799	44,947,998	330,123
Potatoes	16,538,900	52,631	119,348	771	10,000	31
(b) *Dairy Products :*						
Butter and Butter Substitutes ..	5,882,522	255,622	1,107,132	58,893	2,997,955	204,927
Cheese	5,586,244	167,440	513,306	29,167	233,908	14,498
Milk, Condensed	22,667,633	464,886	12,805,323	426,984	3,853,815	140,850
(c) *Farm Products :*	No.		No.		No.	
Eggs, Fresh	21,263,252	77,560	120	9	401	6
	lbs.		lbs.		lbs.	
Hams, Bacon and Salted Meats ..	6,339,737	268,112	551,843	31,590	343,779	15,736
Lard and Lard Substitutes ..	3,182,053	74,037	544,737	25,416	22,825	1,192
Beef	8,949,753	80,516	5,680	142	—	—
Mutton	2,114,384	24,448	17,581	441	—	—
Poultry	216,748	8,610	—	—	—	—
Game	33,685	1,517	1,076	97	50	3
Meats, Tinned	3,867,322	143,050	1,169,521	69,712	1,319,704	77,758
(d) *Miscellaneous :*						
Biscuits and Cakes	2,447,393	68,679	241,991	7,263	112,478	4,182
Confectionery, Jams and Jellies	9,173,301	326,143	2,088,824	100,287	936,436	67,278
Pickles, Sauces, Condiments (including Spices and Tumeric) ..	3,096,580	92,238	2,887,606	110,090	7,109,235	290,481
	cwts.		cwts.		cwts.	
Hops	4,212	26,450	3,776	23,992	4,999	35,178
	lbs.		lbs.		lbs.	
Tobacco (Unmanufactured) ..	1,033,910	50,358	520,432	24,214	449,876	32,708
Tobacco (Cigars, Cigarettes, and other Manufactures	481,050	140,547	226,598	83,056	186,528	78,577
	galls.		galls.		galls.	
Brandy	74,851	61,968	52,046	59,815	32,894	43,451
Wines	88,007	69,873	55,861	46,714	63,727	55,509
	—	5,680,432	—	3,135,240	—	2,626,889
MACHINERY, ETC.						
Agricultural Machinery	—	209,212	—	66,936	—	84,916
Agricultural Implements	—	406,672	—	446,687	—	495,155
Seeds	—	40,450	—	19,563	—	29,742
Sheep Dip	—	107,872	—	51,249	—	58,907
Water Boring Machinery	—	37,353	—	8,664	—	1,865
Fencing Material, Wire, Standards, etc.	—	593,542	—	108,656	—	80,353
Binding Twine and Harvest Yarn	—	19,103	—	40,501	—	157,279
Saddlery and Harness	—	69,587	—	11,500	—	19,639
Windmills	—	79,771	—	43,246	—	30,251
Timber and Wood (Unmanufactured)	—	980,833	—	665,085	—	863,887
	—	2,544,395	—	1,462,087	—	1,821,994

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‡ Further details regarding the importation of livestock are given in the annexures to the report of the Principal Veterinary Officer.

* Ground Nuts excluded.

† Weight of Fresh Fruit not included.

Produce or Article.	1913.		1917.		1918.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
MANURES AND FERTILIZERS.	Tons. (2,000 lbs.)	£	Tons (2,000 lbs.)	£	Tons (2,000 lbs.)	£
Basic Slag	5,970	11,411	636	2,505	—	—
Bone Manure	4,714	20,103	409	2,069	3,361	25,248
Guano	351	1,205	315	1,467	580	2,679
Nitrate of Soda	73	687	—	—	—	—
Potash Manures	1,997	18,107	11	70	—	—
Sulphate of Ammonia	400	4,707	47	802	—	—
Superphosphates	41,013	95,273	6,958	30,425	6,792	78,118
Phosphates, Raw	8,585	35,233	—	—	5,056	6,772
All Other N.O.D.	761	1,705	701	7,811	779	4,306
	63,864	188,431	9,077	45,149	16,568	117,123
BAGS.	Bags.		Bags.		Bags.	
Coal, Grain and Sugar	16,246,492	364,935	27,970,131	750,103	26,820,824	1,053,912
Wool	584,917	59,765	575,295	72,616	989,385	199,675
Flour and Other	19,110,113	60,847	13,138,393	73,814	13,931,984	94,735
	35,941,522	485,547	41,683,819	896,533	41,742,193	1,348,322
GRAND TOTALS	—	£9,158,249	—	£5,594,338	—	£5,994,709

APPENDIX XVIII.

STATEMENT OF EXPORTS.

Statement showing the quantity and value of certain South African Agricultural Products exported from the Union during the calendar years 1913, 1917 and 1918.

Produce or Article. (Produce or Manufacture of the Union.)	1913.		1917.		1918.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	No.	£	No.	£	No.	£
Animals, Living	29,690	38,106	20,103	41,569	21,633	54,485
	lbs.		lbs.		lbs.	
Bark (Wattle)	145,717,738	309,329	92,551,571	223,982	107,904,898	287,220
Bark Extract	—	—	2,784,188	49,520	8,339,459	124,887
Buchu Leaves	163,812	32,071	124,110	20,154	89,675	16,948
Butter	45,318	2,979	2,979,224	196,020	1,316,834	96,756
Cheese	451	19	76,836	5,539	424,993	25,911
Maize	22,944,744	65,169	468,702,325	1,519,860	509,495,794	1,600,137
Maize Meal	4,696,823	18,509	94,072,208	407,356	167,115,124	662,332
Oats	4,308,327	12,868	35,016,550	151,944	7,718,344	28,686
Beans and Peas	23,837	207	7,685,823	92,545	9,592,354	119,801
All other Corn, Grain, Meal, Fodder and Forage ..	15,863,869	37,789	20,596,863	99,314	20,912,194	144,462
Ostrich Feathers	1,023,307	2,953,587	219,048	175,019	108,924	88,628
	No.		No.		No.	
Eggs (Poultry)	1,498,920	8,555	5,910,778	38,799	1,710,368	12,099
	lbs.		lbs.		lbs.	
*Fruit, Fresh (including Nuts)	—	52,000	—	22,738	—	16,947
Jams and Jellies	434,876	6,960	2,330,775	49,161	3,300,419	77,795
Hair, Angora	17,355,882	876,255	3,690,828	280,636	19,645,684	1,641,889
Hides and Skins	—	2,017,863	—	2,637,735	—	2,288,465
Horns	—	16,214	—	3,542	—	2,363
Dripping, Fats, Tallow and Grease	129,646	1,971	154,243	4,335	257,491	9,338
Meats	198,683	5,858	47,350,476	1,049,433	18,818,409	477,418
Sugar, Molasses and Treacle	12,045,371	18,467	4,437,496	60,174	6,098,350	74,518
Tobacco (Unmanufactured)..	240,549	14,728	729,611	36,113	1,473,888	82,552
Tobacco, Cigars and Cigarettes	3,685	851	162,853	50,466	258,059	77,041
	galls.		galls.		galls.	
Wines	55,469	11,515	331,522	49,674	452,428	112,613
	lbs.		lbs.		lbs.	
Wool, Sheep	176,971,865	5,719,288	117,657,142	8,782,280	115,634,498	9,689,630
	—	£12,221,158	—	£16,047,888	—	£17,812,921

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* Further details regarding the imports and exports of Fruit will be found in the report of the Chief, Division of Horticulture.

APPENDIX XIX.

ANIMAL PRODUCTS.

Imports and Exports of Animal Products, during the Calendar Years, 1898, 1917, 1918 (Excluding leather, woollen manufactures, etc.).

IMPORTS.

Year.	1898.		1917.		1918.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	lbs.		lbs.		lbs.	
Butter and Substitutes ..	5,966,210	£289,041	1,107,132	£58,893	2,997,955	£204,927‡
Cheese	3,697,888	98,433	513,306	29,167	233,908	14,498
Eggs	—	16,052	(No.) 120	9	(No.) 401	6
Lard	—	35,777	544,737	25,416	22,825	1,192
Fat and Dripping	—	—	828,560	21,000	413,326	13,018
Tallow	969,710	7,198§	115,361	2,243	30,003	1,268
Meats—Fresh..	12,299,713	78,592	24,337	680	—	—
,, Preserved	—	230,147	1,169,521	69,712†	1,319,704	77,758†
,, Salt or Cured ..	—	78,787	551,843	31,590*	343,779	15,736*
Milk, Condensed	—	278,934	12.805,323	426,984	3,853,815	140,850
		£1,112,961		£665,694		£469,253‡

Note. * Hams, Bacon and Salted Meats.
† Tinned Meats.
‡ Includes 2,344,328 lbs. (£159,992) re-exported in December, 1918.
§ Cape and Natal only, Transvaal figures not available.

EXPORTS.

	1898.		1917.		1918.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Butter	199	£16	2,979,224	£196,020	1,316,834	£96,756
Eggs	—	—	—	38,799	—	12,099
Feathers, Ostrich	—	748,625	219,048	175,019	108,924	88,628
Hair, Angora	11,595,398	683,599	3,690,828	280,636	19,645,684	1,641,889
Horns	—	19,776	—	3,542	—	2,363
Hides—Ox and Cow ..	—	356,882	17,304,022	836,505	12,506,970	548,051
Skins—Sheep and Goats ..	—	373,590	29,404,020	1,794,480	31,172,669	1,734,605
,, Seal	—	1,414	117,333	4,279	107,046	4,710
Wool	97,629,641	2,323,491	117,657,142	8,782,280	115,634,498	9,689,630
Tallow and Grease	44,220	379	115,361	2,243	30,003	1,268
Lard	—	—	24,633	1,547	39,596	2,243
Dripping and Fats	—	—	14,249	545	711,768	3,231
Meats—Beef	—	—	47,252,995	1,043,854	18,656,058	467,184
,, Mutton	—	—	512	13	348	7
,, Pork	—	—	—	—	55,369	2,306
,, Poultry	—	—	449	21	672	41
,, Bacon and Ham ..	—	—	49,652	3,382	89,023	7,002
,, Salted, Tinned, etc.	—	—	46,868	2,163	16,939	878
		£4,507,772		£13,165,328		£14,302,891*

* Exclusive of Cheese—£25,911.

APPENDIX XX.

STATEMENT OF MAIZE EXPORTED FOR CALENDAR YEARS 1910 TO 1918.

Year.	Transvaal.	Orange Free State.	Natal.	Cape.	Total Bags (200 lbs.).
1910	759,830	802,149	192,026	6,203	1,760,208
1911	652,204	314,731	41,556	7,892	1,016,443
1912	444,657	323,991	63,954	140	832,742
1913	77,771	34,783	19,764	—	132,318
1914	773,784	225,687	75,221	50	1,074,742
1915	803,169	650,961	95,331	—	1,549,461
1916	578,373	1,103,875	82,377	—	1,764,625
1917	861,911	1,345,760	113,392	55,421	2,376,484
1918	1,048,914	1,481,906	31,946	31,021	2,593,787

MAIZE MEAL. Total quantity exported 1917–435,132 bags (180 lbs.)
1918–816,134 ,, ,,

APPENDIX XXI.

Statement of the Export of South African Meat, during the period 1910-'18.

	1910.		1911.		1912.		1913.		1914.	
	Weight.	Value.	Weight.	Value.	Weight.	Value.	Weight.	Value.	Weight.	Value.
	lbs.	£	lbs.	£	lbs.	£	lbs.	£	lbs.	£
Beef ..	5,027	98	229,498	4,844	296,834	6,729	121,264	3,161	463,767	10,039
Mutton	357	18	60,909	1,308	128,686	2,577	26,382	619	107,963	2,266
Pork ..	274	5	15,022	347	48,191	1,028	14,130	364	18,613	494

	1915.		1916.		1917.		1918.		Total.	
	Weight.	Value.	Weight.	Value.	Weight.	Value.	Weight.	Value.	Wt.	Value.
	lbs.	£	lbs.	£	lbs.	£	lbs.	£	lbs.	£
Beef ..	5,971,727	106,112	17,686,121	354,341	47,252,995	1,043,854	18,656,058	467,184	90,683,291	2,996,362
Mutton	319,897	7,516	768	18	512	13	348	7	645,823	14,342
Pork ..	42,209	1,217	55,345	1,634	Nil.	Nil.	55,369	2,306	249,153	7,395

APPENDIX XXII.

Figures showing the Importation of Pedigree Stock to South Africa, during the period 1910 to 1918.

	1910.		1911.		1912.		1913.		1914.	
	No.	Value.	No.	Value.	No.	Value.	No.	Value.	No.	Value.
		£		£		£		£		£
Bulls and Oxen ..	115	6,547	248	12,733	226	13,611	745	40,402	298	19,010
Cows and Calves ..	303	8,057	349	6,044	469	12,710	1,443	53,152	724	28,883
Sheep and Lambs ..	3,317	26,913	2,776	24,319	5,426	37,460	6,168	42,552	2,980	21,782
Pigs	38	423	18	267	81	543	64	697	74	615

	1915.		1916.		1917.		1918.		Total.	
	No.	Value.	No.	Value.	No.	Valuo.	No.	Value.	No.	Value.
		£		£		£		£		£
Bulls and Oxen ..	143	10,157	219	17,123	229	16,816	207	20,961	2,430	157,360
Cows and Calves ..	158	7,374	349	20,263	304	16,345	475	32,568	4,574	185,396
Sheep and Lambs ..	690	6,074	1,872	15,145	483	8,015	149	9,141	23,861	191,401
Pigs	21	257	56	872	7	97	5	115	364	3,886

APPENDIX XXIII.

Statement prepared by Sheep Division showing the Number of Sheep and Goats in the Union from 1911-1916.

Year.	Sheep.		Goats.		Total.
	Woolled.	Non-Woolled.	Angora.	Others.	
1911 ..	22,774,941	10,687,283	4,791,862	7,943,095	46,197,181
1912 ..	27,331,167	8,557,754	4,395,101	7,296,061	47,580,083
1913 ..	28,327,907	7,480,093	4,194,884	7,211,142	47,214,026
1914 ..	No statistics taken.				
1915 ..	25,943,806	5,590,274	2,844,505	6,073,767	40,352,352
1916 ..	26,490,524	5,490,181	2,564,289	6,397,407	40,942,401
1917 ..	No statistics recorded by Sheep Division since census taken by Office of Director of Census.				
1918 ..	30,632,945	7,610,269	3,065,116	6,296,998	47,605,328

APPENDIX XXIV.

WEATHER CONDITIONS.

From January to March, 1918, the rainfall was generally good, exceeding the normal amount in all parts of the Union excepting Bechuanaland, the south of the O.F. State and the south-eastern and south-western districts of the Cape Province. April was however exceptionally dry, the usual amount of precipitation being nowhere reached. Over the eastern borders of the Transvaal and the extreme High Veld, rain only fell towards the close of the month; while over the remainder of that Province, and also over Bechuanaland and the west of the O.F. State, no precipitation occurred. Scattered showers fell over the centre, east and south of the O.F. State, towards the middle of the month, and over the north towards the end; but here also many parts were quite rainless. In the Cape Province, the west coast and the northern borders were likewise rainless, and over the remainder of the Province only light showers fell during the middle and towards the end of the month. Light rains fell over Basutoland in the middle, and over Natal towards the close, of the month.

Despite the period of drought the year's precipitation (from January 1st), still remained above the normal over the Transvaal (excepting the northern and extreme south-western districts) Natal, the north-east of the O.F. State, the centre of the Cape, and along the south and south-east coasts, while the deficit over the remainder of the Union was not large.

Over Natal, the inland parts of the Transkei, the eastern half of the Transvaal, and the north-east of the O.F. State, both day and night temperatures during April were lower than usual; whilst over all other parts of the country the nights were slightly colder and the days much warmer. The mean air temperature over the Union was only slightly below normal and there were no destructive frosts.

In May the rainfall over the Transvaal and O.F. State was confined to a few light local showers during the first half of the month, and the average amount was again not reached. In Natal light to fair rains fell during the same period and the normal amounts were exceeded along the coast, although they were not quite reached in the interior of the Province. Over Bechuanaland, the northern borders and the north-east of the Cape Province, and the Northern Karroo light showers were experienced during the first week, and whilst the amounts recorded were below the average in the first mentioned district they were generally above in the others. Over the central Karroo precipitation occurred at the beginning and end of the month, but the amounts were below the normal. There was also a deficit over the Southern Karroo, where the rain fell only during the second half of the month; over Kaffraria, where light showers fell during the first three weeks, and over the south and south-eastern Coastal regions, where a more regular distribution over the month occurred. Over the south-western districts of the Cape, the rainfall was also more evenly distributed with regard to time; but here, as also over the Cape Peninsula and West Coast where rains fell during the first week and last eleven days of the month, the amounts recorded were in excess of the average.

The day temperature were below the normal everywhere, excepting the south-east and south coasts of the Cape. The nights were likewise colder, excepting in the north of Natal, the north-east of the O.F. State and over the Cape southern districts. In the interior heavy frosts occurred towards the close of the month, while snow fell in many parts of the southern half of the Cape Province. The mean air temperature was about one and half degrees below the average.

Over the Winter Rainfall Area good rains fell at fairly regular intervals during June, and the quantity recorded was everywhere above the average. Over the rest of the Union, there was little more than light isolated showers and the quantities were below the normal.

Both day and night temperatures were higher than usual over the west and south-west of the Union, and colder over the Transkei, and north-east of the Cape, Swaziland, the north of the O.F. State and the north of the Transvaal; over the north of Natal and north-east of the O.F. State, the days were colder and the nights warmer. Over the remainder of the Union, the day temperatures were above normal and the night temperatures below. The mean air temperature for the whole country was almost normal. Severe frosts inland were general, and cold spells occurred at the beginning and end of the month.

Over the Summer Rainfall Area scattered showers fell during the month of July, and during the last few days general rains occurred. Over the Winter Rainfall Area and along the South Coast precipitation was fairly evenly distributed throughout the month, except for a dry spell from the 6th to the 16th. The amounts recorded were in excess of the normal in Natal, the O.F. State, the Cape Province (except along part of the West Coast and over the belt in the south-east containing Umtata, Queenstown and Bedford), the Eastern Transvaal, and the Southern half of Bechuanaland. Over the remainder of the Union, the normals were not reached, but in most cases the deficits were small. A few falls of hail were reported. The year's rainfall (from January 1st), now showed an excess in all parts of the Union, except the southern half of the O.F. State and within a belt runnning from the Cape Peninsula through Swellendam, Uniondale, Somerset East, Queenstown to Kokstad. The excess was somewhat large over the Eastern Transvaal and Swaziland.

Both day and night temperatures were higher than usual over Swaziland and the Transvaal (except the north and extreme south-east), and colder over the north of the Orange Free State, the south-east and extreme south-west of the Cape Province, and along the west, south and east coasts. Elsewhere the days were colder and the nights warmer than usual. The mean air temperature for the whole Union was slightly less than a degree below the normal. The month was generally mild with a cold spell, accompanied in some instances by severe frosts, during the last week.

In August, light rains fell over the Winter Rainfall Area, towards the middle and end of the month, but the quantities recorded were much below the normal. In some parts of the Karroo the period was quite rainless. Only over the Northern Borders and the north-east of the Cape were the normal quantities exceeded, and this was due to general rains over the Summer Rainfall Area at the beginning and end of the month. In the Transvaal, O.F. State, Natal, Swaziland, Kaffraria, Bechuanaland and Basutoland, the normals were likewise exceeded. At the beginning of the month the precipitation took the form of snow in some places. Severe hailstorms occurred at Ingwavuma on the 3rd, and Mafeking on the 31st.

Over the west and south-west of the Cape Province, the days were much hotter than usual; the night temperatures were also above normal, but to a less marked degree. These conditions extended inland in a north-easterly direction, but did not reach the northern borders and the north-eastern and south-eastern districts. Over the northern borders and Bechuanaland the nights were warmer and the days colder, whilst over the north-eastern and south-eastern districts and also over Kaffraria, Natal, the O.F. State, and the Transvaal, both days and night were colder. Over most of this area the day temperatures were considerably below the average, and frosts at night were frequent. The mean temperature of the air for the whole Union was slightly below the normal.

Rains were general over the whole country during the first few days of September, and continued at fairly regular intervals throughout the month over the Winter Rainfall Area and Natal, becoming general again, except over the Transvaal, during the last week.

During the last few days of the month precipitation along the south coast was heavy in places, 3·25 inches falling in twenty-four hours at Swellendam and 3·38 inches at Belvedere (Knysna). Along the south coast, over Bechuanaland, and the Orange Free State, and the Northern Borders of the Cape Province contiguous thereto, the normal amounts for September, were generally well exceeded, whilst over the remainder of the Union deficits or excesses were usually small. A few hailstorms occurred, but they were generally not severe, and excepting for fruit trees and gardens at Krugersdorp (Transvaal) and Jamestown (Cape), no serious damage was done.

Over the Orange Free State and Natal, Basutoland, and the north-east of the Cape Province, the day temperatures were below the normal and the night temperatures above. Over the remainder of the country both the days and nights were warmer than usual. The mean air temperature for the Union was about two degrees above normal.

The month of October saw a fairly even distribution of rainfall with regard to time over the Transvaal, O.F. State, Natal, Swaziland, Kaffraria, and south-east of the Cape Province; also over Bechuanaland, except during the first week. The amounts recorded over these areas were below the normal along the coast, over Swaziland and the northern half of the Transvaal, and above the normal elsewhere. Over the Northern Borders of the Cape Province, rain fell only during the last few days of the month; and over the Karroo, except in the south, precipitation was confined to the same period. The amounts show an excess in the south and extreme north of this area, and a deficit over the remainder. In the north-east of the Cape, the rain on the 14th and 29th gave quantities generally above the normal; but the precipitation over Basutoland during the first week and last few days of the month was below the normal quantity. Over the western and southern coastal regions of the Cape there was a deficit; but over the Peninsula and south-western districts light showers fell at fairly regular intervals, and the normal was exceeded.

Hailstorms occurred at various places, but little damage resulted.

The month of October, 1918, was hotter than usual, both day and night temperatures having been above the normal in almost every part of the Union. The mean air temperature was one and a half degrees above the mean.

In November, general rains commenced in the Transvaal and O.F. State on the 11th, and continued at intervals until the end of the month. The quantities recorded were however below the normal, except in the west and south of the first named Province and the central districts of the Orange Free State. Precipitation in Natal was distributed fairly evenly throughout the month and was generally below normal, although individual stations experienced heavy showers on the 10th, 24th and 26th. An excess is shown for the Cape Peninsula owing to light rains throughout the month with several moderately heavy showers on the 14th and 18th. Rainfall was also above the normal over the southern half of Bechuanaland, and the extreme north-east of the Cape. A deficit was experienced over the remainder of the Cape, where only scattered showers occurred, and Basutoland, where rains fell mainly during the second and third weeks of the month. Hailstorms were of frequent occurrence, but in the majority of cases caused only slight damage. On the 22nd however, a severe storm between Matiwane and Wesselsnek, in the Ladysmith district (Natal), with hailstones approximating to the size of a goose's egg, caused considerable damage to property, and resulted in the destruction of crops and great losses of small stock. Less severe storms occurred on the 30th at Oshoek, Transvaal, and at Brandfort and Dewetsdorp in the Orange Free State, gardens, orchards and property being damaged; considerable damage and flooding also occurred in the Germiston districts and other parts of the Rand on the latter date.

Both day and night temperatures were above the normal over the eastern half of the Transvaal, the northern half of the west coast, the north of Natal, Swaziland and the Cape Peninsula. On the other hand the days and nights were both colder than usual over the west and south-west of the Transvaal, the O.F. State (except the south), Bechuanaland and the extreme north-east of the Cape Province. In Natal (except the north), the maximum temperatures were considerably below and the minimum temperatures slightly above the normal; elsewhere in the Union the days were warmer and the nights colder than usual. The mean air temperature for the whole country was practically normal.

Over the Transvaal scattered showers fell during the first part of December; this was succeeded by a period of drought, and it was only towards the close of the month that good general rains fell and brought the quantities recorded in all parts except the extreme south-west and the eastern escarpment above the normal. Somewhat similar conditions prevailed over the O.F. State, where the rains at the end of the month were sufficient to cause floods in parts. The rainfall of Natal was distributed more regularly over the month; but here also the quantities were generally in excess of the normal. Over the whole of the Cape Province, the month's precipitation was below the normal. In many parts of the Karroo, the Northern Borders, and the Winter Rainfall Area no rain whatever fell, and over other parts of the Province nothing beyond a few light showers were experienced. Many hailstorms were reported, but no great damage appears to have resulted, except at Platkop in the Division of Ficksburg, O.F. State.

The rainfall during the year 1918, showed a large excess over the Transvaal, Swaziland, Bechuanaland, the north of Natal and the coasts of Natal, and Kaffraria, with excesses of lesser degree over the northern half of the O.F. State, the Northern Borders of the Cape, the northern halves of the northern Karroo and west-central Karroo, and the south-western districts of the Cape and a deficit over the remainder of the Union.

Over the Transvaal, except the west and south-west, Swaziland and the Cape Province, except the north-western districts, both the days and nights were warmer than usual during December, while in the west of the Transvaal, the north-west of the Cape, the south and north-east of the Orange Free State and the north of Natal, both days and nights were cooler. In the north and centre of the Orange Free State, the day temperatures were above normal and the night below; whilst over the south of Natal, these conditions were reversed. The mean temperature of the air for the whole Union was about normal.

During January, 1919, rains fell at fairly equal intervals over the Transvaal, Natal, the northern half of the O.F. State, Basutoland, Kaffraria and the south coast of the Cape. Over the southern half of the O.F. State, the south-east and north-east of the Cape, and over the south-west of the Cape and the district to the north extending to Clanwilliam, precipitation was confined to the second half of the month, whilst over the Karroo and Northern Borders of the Cape, scattered showers fell towards the middle. A few scattered showers fell in Bechuanaland. The normal amounts were exceeded in the north, centre and south-east of the Transvaal, the centre of the O.F. State, and over the eastern, southern, and south-western coastal regions of the Union; over all other parts there was a deficit. Over the Transvaal, O.F. State and Natal, many hailstorms occurred. At Niekerksvlei (Standerton district, Transvaal), on the 8th, oat and maize crops were badly damaged by such a storm, and on the 11th at Castlekop (Barberton district, Transvaal), damage estimated at £3,000 was done. At Waterval (Boshof district, O.F.S.), gardens and crops were destroyed and 30 sheep killed on the 13th and on the 18th. At Georgeskraal (Vrede district, O.F.S.), the crops suffered severely. At and around Willow Grange Station (Natal), on the 10th, crops were destroyed.

Over the northern half of the O.F. State, the Transvaal High Veld, Swaziland, Basutoland, Kaffraria and the Cape, east-central Karroo, both day and night temperatures were higher than usual; whilst along the Western Borders of the Transvaal and over the Cape Peninsula and the districts north thereof extending to Clanwilliam, both day and night temperatures were slightly below the normal. Over the remainder of the country (except the centre and north of the Transvaal, where the days were colder and the nights warmer), the days were warmer and the nights colder. The mean air temperature for the whole Union was about one degree above the normal. No frosts occurred.

Except in the north of the Transvaal, and over Natal, and the Cape Peninsula, where scattered showers were recorded, little or no rain was experienced throughout the country during the first half of February. General rains, however, fell during the third week of the month over the Transvaal, Natal, the east of the O.F. State, in Kaffraria, and along the south and east coasts of the Cape; over the remainder of the Union, a condition of drought prevailed broken only by light showers. During the last half of the month, however, some large quantities were recorded in the 24 hours over limited areas, particularly in the Zoutpansberg, Transvaal, and along the south coast. Thus at Broederstroom in the Zoutpansberg, more than ten inches fell on the 19th, the gauge overflowing; whilst at Storms River (Division, Humansdorp), Cape, 7·02 inches were recorded on the 17th., and during a rainy spell between the 16th and 22nd, 4·94 inches at Uitenhage on the 20th, produced a flood in the town causing damage to the streets; moderate floods occurred at the same time in the lower reaches of the Zwartkops and other local rivers.

The rainfall for the month was below the normal in all parts except Swaziland, the extreme north of the Transvaal, the north of Natal, in Kaffraria, the west-central and east-central Karroos, the Cape Peninsula, and along the south and east coasts of the Cape. Elsewhere there was a deficit ranging from 0·79 inch to 3·08 inches in the Transvaal, from 0·29 to 1·72 inches in Natal, from 0·56 inch to 3·01 inches in the Orange Free State, and from 0·13 inch to 2·17 inches in the Cape; the deficit in Basutoland amounted to 4·06 inches. Hailstorms were of frequent occurrence, but in the majority of cases caused only slight damage. Heavy storms were, however, experienced at Macsvale, Barberton (Transvaal), on the 9th, and at Dullstroom, in the Lydenburg district (Transvaal), on the 10th, whilst on the 12th crops were damaged and poultry killed at Preston Park, Maclear (Cape). An exceptionally severe storm lasting 35 minutes and accompanied by stones, approximately a fowl's egg in size, also occurred at Clarksbury, in the district of Engcobo (Cape), on the 22nd, and resulted in the destruction of poultry and much damage to property.

The days were warmer and the nights colder than usual in Bechuanaland, the north and centre of the Orange Free State, Kaffraria, and along the northern half of the West Coast; whilst in Natal the night temperatures were above and the day temperatures below the normal. Elsewhere in the Union (except over the northern Karroo, the east of the Orange Free State, and the west and extreme south-east of the Transvaal, where both the maximum and minimum temperatures were below the normal), both days and nights were warmer than usual. The mean air temperature for the whole Union was slightly above the normal. No frosts occurred.

In March the rainfall was above the average around the coast of the Union; but the belt of land affected was very narrow except in the south-west of the Cape, where it extended in a north-easterly direction to Fraserburg and Beaufort West; in the Transkei, where it extended westwards to Kokstad and Umtata; and in Natal, where it took the form of a narrow tongue extending westwards and enclosing Verulam and Weenen. Over the remainder of the Union, except the Rustenburg and Waterberg districts of the Transvaal, the amounts recorded showed a deficit, which was generally fairly large over the Summer Rainfall area. Except over the Cape Peninsula and South-western Districts, where the only showers of the month fell on the 28th, and over Natal where the rainfall was fairly equally distributed throughout the month, the period between the 20th and the 31st was rainless. Over parts of Natal on the 8th, Kaffraria on the 16th, and the Transvaal and north of the Orange Free State between the 17th and 19th, the rainfall was rather heavy. Very little hail fell and practically no damage occurred from that cause.

Both day and night temperatures were above the normal over the Cape Province, Swaziland and Basutoland. Over the Transvaal and Orange Free State the days were warmer and the nights cooler than usual: over Natal days were cooler and nights warmer. The mean air temperatures for the whole Union were about two and a half degrees above normal, and the night temperatures one degree above.

APPENDIX XXV.

Act No. 15 of 1913:

ADULTERATION OF WINES, SPIRITS AND VINEGARS.

During the year samples were purchased, for analysis, in the following districts of the Union:—

Cape.—Aberdeen, Aliwal North, Beaufort West, Butterworth, Cape Town, Carnarvon, Cathcart, Cradock, East London, Elliot, Elliotdale, Graaff-Reinet, Grahamstown, Hopetown, Kimberley, Komgha, Maclear, Mafeking, Malmesbury, Oudtshoorn, Paarl, Port Elizabeth, Port St. John's, Queenstown, Robertson, Somerset West, Swellendam, Tsolo, Uitenhage, Umtata, Victoria West, Vryburg, Wodehouse, Worcester.

Transvaal.—Johannesburg, Lichtenburg.

Natal.—Durban, Dundee, Pietermaritzburg, Vryheid.

Orange Free State.—Bloemfontein, Bethlehem, Dewetsdorp, Edenburg, Fauresmith, Harrismith, Heilbron, Ladybrand.

The samples purchased totalled 510 as compared with a total of 1,234 purchased during the previous year. The reduction is in a large measure due to a system introduced during the year whereby the official purchaser tests the spirits in the bars by means of a Sikes Hydrometer and only purchases such samples as, according to the Hydrometer Test, fall below the strength fixed by law. In the case of brandy, while many samples according to the Hydrometer Test are below strength, on subsequent analysis they are found to comply with the law owing to the allowance made for obscuration due to the presence of sugar and prosecutions do not, therefore, follow in such cases.

The result of the analyses are shown in the table hereunder:—

Article.	No. of Samples.	Adulterated or Deficient.	Incorrectly Labelled.	Artificial or not Genuine.	No. of Prosecutions (by samples).	No. of Convictions (by samples).
Brandy	305	79	17	—	57	26
Whisky	88	12	3	—	4	—
Gin	15	8	—	—	3	1
Wine	34	2	8	—	—	—
Vinegar	67	4	10	1	4	3
Liqueur	1	1	—	—	—	—
Totals ..	510	106	38	1	68	30

Owing to the fact that several gins were found on importation to fall below the legal strength it was decided during the year to abolish the existing list of approved gins and to re-examine all gins coming in after a certain date of which due notice was given to importers in order that manufacturers abroad might be warned.

It becomes increasingly difficult to secure convictions in view of the provisions of section *thirty-three* of the Act the majority of acquittals being on account of the "lack of knowledge" alleged by the accused. It seems a strange anomaly that whereas in the case of food adulteration (milk, etc.), the master is held responsible for the action of his servants whether he is aware of such actions or not, in the case of spirituous liquors he almost invariably escapes punishment if he can satisfy the Court that the adulteration was done without his knowledge.

In addition to the 510 samples purchased in the Union referred to above 76 samples were analysed on importation, with the results shown hereunder:—

Article.	No. of Samples.	Adulterated or Deficient.	Incorrectly Labelled.	Artificial or not Genuine.	Refused admission into Union.
Brandy	11	5	5	—	4
Whisky	28	6	—	—	2
Gin	16	5	—	—	—
Wine	17	—	1	—	1
Vinegar	1	—	—	—	—
Beer	1	—	—	—	—
Rum	2	2	—	—	2

FRED. W. GREEN.
Administrator, Act No. 15 of 1913.

20th August, 1918.
[U.G. 40—'19.]

APPENDIX XXVI.

CAPE CO-OPERATIVE WINERIES.

Statement showing position of Government Loans as at 31st March, 1919.

Winery.	Amount of Government Loan.	Repaid to 31/3/19.	Amount outstanding 31/3/19.
	£	£ s. d.	£ s. d.
Drakenstein	5,000	670 12 1	4,329 7 11
Drosdy	5,500	737 13 4	4,762 6 8
Helderberg	10,000	1,341 4 3	8,658 15 9
Montagu	5,000	670 12 1	4,329 7 11
Paarl	4,000	4,000 0 0	—
Wellington	5,000	670 12 1	4,329 7 11
	£34,500	£8,090 13 10	£26,409 6 2

All instalments due have been paid, and one Winery has paid up £3,562 during the past year and has now paid off the entire loan.

APPENDIX XXVII.

GRANTS-IN-AID TO AGRICULTURAL SOCIETIES.

Grants to Agricultural Societies in Natal and the Orange Free State and to Union Societies were made during the year ending 31st March, 1919 as follows :—

	£	s.	d.
Orange Free State.			
Central Agricultural Society	1,300	0	0
Hoopstad Agricultural Society	100	0	0
Kroonstad Agricultural Society	100	0	0
Fauresmith Agricultural Society	100	0	0
Rouxville and Zastron Agricultural Society	100	9	6
Thaba 'Nchu Agricultural Society	92	6	1
Ladybrand Agricultural Society	36	8	9
Marquard Agricultural Society	133	14	0
O.F.S. Agricultural Society	30	2	4
Bloemfontein Poultry Society	62	2	9
Harrismith Poultry Club	47	12	1
Wolvehoek Cow-testing Association	35	0	0
O.F.S. Stud Breeders Association	25	0	0
O.F.S. Agricultural Judges Association	67	6	0
Natal.			
Royal Agricultural Society	839	6	3
Klip River Agricultural Society	169	6	3
Weenen Agricultural Society	167	7	11
Richmond Agricultural Society	144	18	2
Dundee Agricultural Society	130	16	0
Umvoti Agricultural Society	112	2	11
Camperdown Agricultural Society	62	14	0
Dronkvlei Agricultural Society	62	3	9
New Hanover Agricultural Society	23	0	0
Mooi River Agricultural and Industrial Society	8	4	1
Underberg Farmers Association	30	14	3
Empangeni and District Farmers Association	25	0	0
Nottingham Road Farmers Association	17	2	0
Colenso Farmers Association	3	18	9
Melmoth Farmers Association	1	17	6
Natal Poultry Club	70	18	3
Durban and Coast Poultry Club	62	12	7
Klip River Poultry Club	6	1	8
Newcastle Poultry Club	23	16	9
Umvoti Poultry Club	19	8	0
Vryheid Poultry Club	14	6	2
Weenen County	13	7	6
S.P.C.A., Durban	157	11	9
S.P.C.A., Pietermaritzburg	14	9	6
Union Associations.			
S.A. Agricultural Union	500	0	0
S.A. Stud Book Association	200	0	0
S.A. Poultry Association	145	16	0
S.A. Cotton Growers Association	25	0	0
Total	5,293	4	6

62

Grants-in-aid to Societies in the Cape and Transvaal Provinces are made by the Administrations of these Provinces.

	Price. s.	d.
Factories Act 29 of 1918, Structural Requirements of the	0	6
Fencing Act, No. 17, 1912 (English and Dutch)	0	6
Field Cornet's Manual, 1904 (English)	2	0
French Refugees at the Cape, (Cloth) (C. Graham Botha)	5	0
Geodetic Survey of South Africa, Vol. I., 1894	7	6
Do. do. Vol II., 1899	10	6
Geslacht Register der Oude Kaapsche Familien :		
Vol. 1, A-J, ½ Cloth .. .. nett	7	6
Do. ½ Calf	14	0
Vol. 2, A-O, ½ Cloth	7	6
Do. Cloth	11	6
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DEPARTMENT OF AGRICULTURE.

REPORT

WITH

APPENDICES

FOR THE

Fifteen Months from 1st April, 1919 to 30th June, 1920.

Presented to both Houses of Parliament by Command of His Royal Highness the Governor-General.

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[U.G. 13—'21.]

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UNION OF SOUTH AFRICA.

DEPARTMENT OF AGRICULTURE.

REPORT

WITH

APPENDICES

FOR THE

Fifteen Months from 1st April, 1919 to 30th June, 1920.

Presented to both Houses of Parliament by Command of His Royal Highness the Governor-General.

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REPORTS FOR THE FIFTEEN MONTHS FROM 1ST APRIL 1919, TO 30TH JUNE, 1920.

CONTENTS.

			Pages.
Covering Memorandum by the Secretary for Agriculture		... ...	1
Report No.	1.	Under Secretary for Agriculture (Education)	2
do.	2.	Acting Principal Veterinary Officer	19
do.	3.	Acting Director of Veterinary Research	24
do.	4.	Chief, Division of Sheep	29
do.	5.	Chief, Division of Entomology	35
do.	6.	Chief, Division of Botany and Plant Pathology	39
do.	7.	Superintendent of Dairying	45
do.	8.	Agricultural Research Chemist	47
do.	9.	Chemist	51
do.	10.	Chief, Division of Tobacco and Cotton	53
do.	11.	Chief, Division of Horticulture	57
do.	12.	Government Viticulturist	59
do.	13.	Registrar, Co-operatieve Agricultural Societies	61
do.	14.	Government Agronomist	69
do.	15.	Superintendent, Government Guano Islands	71
do.	16.	Chief Inspector of Grain	75
do.	17.	Librarian	76
do.	18.	Brands, etc.	77
do.	19.	Adulteration of Wine, Spirits and Vinegar	77

UNION OF SOUTH AFRICA.

Report of the Department of Agriculture for the Fifteen Months from 1st April, 1919, to 30th June, 1920.

Presented to both Houses of Parliament by Command of His Royal Highness the Governor-General.

THE MINISTER OF AGRICULTURE.

I have the honour to submit the Report of this Department for the 15 months ended 30th June, 1920.

For a number of years the annual report covered the 12 months ended 31st of March, but it was arranged, with your approval, that, commencing with 1920, it should be for the period ended 30th June. The present report is, therefore, in respect of a period of 15 months. I might recapitulate the reasons for the change, viz.:—

(1) that the 31st of March falling usually in the early part of the session of Parliament, several months go by before officers can prepare their reports without detriment to other duties;

(2) in consequence the report is belated;

(3) the year ended 30th June is a more satisfactory period for reporting upon agriculture, as it does not break into the season for several important industries, such as maize, sugar and dairying.

You also agreed to the report being a succinct record of work performed during the year, unencumbered by detail, and freed of advice and expressions of opinion, for which the Department's *Journal* should be regarded as the proper medium.

As you are aware, I was absent from the Department for more than 2½ years, first as a member of the Grain Elevators Committee and, upon completion of the work of that body, as member of the Public Service Commission of Enquiry. I returned to the Department in October, 1920. On this account I refrain from furnishing a covering report on the present occasion.

P. J. DU TOIT,
Secretary for Agriculture.

REPORT No. I.

AGRICULTURAL EDUCATION.

REPORT OF THE UNDER SECRETARY FOR AGRICULTURE (EDUCATION).

Mr. Alex. Holm, who had filled the post of Under-Secretary with marked ability during the past seven years, was offered and accepted the appointment of Director of Agriculture for the Kenya Colony, East Africa, and left at October 31st, 1919. The undersigned was subsequently transferred from the School of Agriculture, Potchefstroom, and appointed in his stead.

The demands made by the work are continually growing, and there is a great need for further additions to staff. Much information has been accumulated as a result of experiments and experience gained and more itinerant officers are required to convey the knowledge to the farmers throughout the country. Again, as already strongly urged by my predecessor, more attention is necessary to be given to work of investigation and research. The great field of agricultural research in South Africa lies almost untouched. This task, which promises so much for the development of the country in the present and future, demands all possible support. It must be admitted that qualified men are very difficult to obtain. The chief hope in this respect lies in the training of South African youths by means of scholarships; but greater facilities for work must also be provided. It is unsound to employ staff who have not the equipment wherewith to carry out their work properly. Yet there is danger of this being done. The provision of buildings and plant has fallen behind owing to the difficult conditions which have prevailed during several years past. New school buildings are required at Grootfontein where the military bungalows which were instituted as temporary accommodation ten years ago, are still in use. The construction of a dozen houses for staff residences will be undertaken during the coming year. They will be of great assistance, but more will be required. There is a very pressing need for many services falling under Minor Works such as the increase of water supplies, the provision of pot-houses for experiments, insectaries, poultry houses and other improvements which are indispensable to the progress of the work.

There is an urgent need too for the establishment of several sub-experiment stations which are required to serve districts where the conditions and problems of crop production are dissimilar from those represented at any of the School farms; such stations would be devoted to experiments in crops, including manuring and the improvement of the system of farming in the areas where they may be situated.

Experiments conducted on a co-operative basis with farmers may be useful in relation to certain aspects of this work, but in other respects are of no assistance, especially to test methods designed for the improvement of the general system of farming.

The Elsenburg farm has been extended by the purchase of Mariendahl, an adjoining property 900 acres in extent, which was taken over in the beginning of June, 1919. This will form a very valuable addition not only in farming land, but in providing an extension of the orchards and vineyards. It will now be possible to keep a larger dairy herd which is necessary for the support of dairy classes.

Activities which had been retarded during the War have been revived in the period under review, and it is pleasing to be able to indicate satisfactory progress in many directions. With the return to Peace conditions, larger numbers of students have come forward for agricultural training. These have been supplemented by many returned soldiers who were accepted for entry to the general courses and also for special training, and the Schools of Agriculture were never so well filled as in the first half of the School year of 1920. A reference to the section which follows dealing with this subject, will show that there were 302 students in attendance at regular and special courses, besides 137 in the one-year Returned Soldiers' Course, and 398 in Winter Vacation and other Short Courses held during the year of report.

Additional facilities for the training of returned soldiers were provided by means of four training farms which were opened early in 1919. One hundred and two men have received instruction at these farms. The admission of returned soldiers and the general arrangements in regard to their training were carried out under the direction of Mr. A. H. Harrison of this office, who, by his services in this connection contributed much to the success of the work. Mr. W. G. Mason, B.Sc., formerly Principal, School of Agriculture, Elsenburg, who was appointed Director of Training Farms in May, 1919, and who worked under considerable difficulties, imposed by a limitation of time, succeeded in equipping the farms, and establishing a satisfactory system of training without undue delay.

SCHOLARSHIPS AND BURSARIES.

The award of scholarships for study oversea was resumed in 1919, and twenty new scholarships were granted. Seven students who had completed the training returned to take up work in the Government service.

The following is a summary showing the work accomplished in training scholars oversea to date (30/6/20):—

Scholarships or Grants made	98
Number of scholars returned	50
,, in Government employ	29
,, still engaged in study	42

Eight assistance bursaries, each of the value of £50 per annum, were awarded during the year to needy students who entered the Schools of Agriculture.

AGRICULTURAL CONDITIONS.

The period from April, 1919, to June, 1920, was generally a very prosperous one from the farmer's point of view. The greater part of 1919 was marked by a very severe drought throughout the Eastern and the North-West districts of the Cape and the most of the Orange Free State, and heavy losses of stock occurred as a result. Prices of all farm products ruled high, however, and farmers were able to recoup their losses to a great extent. Prices obtained for wool were unprecedented. Slaughter stock were in strong demand at high prices. Wheat and other cereals were high and also maize, though many maize growers had contracted for the disposal of their 1919 crop before the main advance in the market took place. Many farmers took advantage of money in hand to buy more largely of pedigreed stock for the improvement of their flocks and herds, and there was, consequently, an increased demand for breeding animals. Pig raising suffered a temporary set back owing to the high prices of feeds and the development of the poultry industry has been hindered for the same reason.

Wine farmers had a most successful year. Other fruits did not yield well on the average, and the fruit grower's position was not so favourable. In keeping with the big returns obtained for farm produce there has been a marked increase in the price paid for land. A growing shortage of labour for farm work has been experienced.

STAFF.

Considerable progress was made during the year in filling vacancies on the staffs of Schools of Agriculture, especially at Glen, which was very much understaffed throughout the first year of the school course. The improved scales of pay for technical officers introduced at the close of 1919 have been of great assistance by reason of the better inducements offered men on entering the service.

Staffs engaged in Poultry work were strengthened by the addition of two itinerant instructors who have been stationed at Potchefstroom and Glen, respectively. There were two notable resignations of officers who left to take up University appointments.

The following statement shows the numbers and classification of officers employed in Agricultural Education at June 30th, 1920:—

	Head Office.	Elsenburg.	Grootfontein.	Cedara, including Winkelspruit.	Potchefstroom.	Glen.	As at 30th June, 1920.
Professional and Technical	3	13	18	10	14	10	68
Administrative and Clerical	4	5	5	3	5	2	24
Instructors and Assistants	—	9	14	7	9	9	48
Totals ..	7	27	37	20	28	21	140

The principal changes in staff were as follows:—

Appointments.—Dr. H. W. Turpin, M.Sc., Ph.D., Itinerant Instructor and Experimentalist, Grootfontein; I. P. J. du Plessis, M.Sc., Assistant Lecturer in Chemistry, Grootfontein; L. Coles, B.O.F.D., Lecturer in Dairying, Grootfontein; J. P. van Zyl, B.A., Ph.D., Lecturer in Chemistry, Glen; R. Mathew, Farm Manager, Glen; J. W. Cleghorne, Lecturer in Engineering, Glen; E. H. Hall, M.Sc., Lecturer in Animal Husbandry, Glen; R. Bigalke, M.A., Lecturer in Entomology, Glen; E. G. L. Smith, Lecturer in Horticulture, Glen; W. G. Mason, B.Sc., Director of Training Farms; P. J. J. Fourie, M.R.C.V.S., Lecturer in Veterinary Science, Grootfontein; B. S. Parkin, B.A., M.R.C.V.S., Lecturer in Veterinary Science, Elsenburg.

Resignations.—H. D. Leppan, B.S.A., Experimentalist, resigned at the 21/5/19, to take up an appointment under the Faculty of Agriculture at the Transvaal University College; E. M. K. Geiling, B.A., Ph.D., resigned 31/7/19, and took up a position at the Cape Town University; A. Ireland, Farm Manager, Cedara; P. Fowlie, Experimentalist, Cedara; Miss Lavecour, Domestic Science Instructor; M. Lundie, Assistant Chemist, Grootfontein.

Transfers.—T. G. W. Reinecke, B.A., M.Sc., Principal, Elsenburg, transferred to Potchefstroom on 1/4/20; W. J. Lamont, Vice-Principal, Grootfontein, transferred to Elsenburg, and appointed Principal; D. Deenik, Lecturer in Dairying, transferred from

Grootfontein to Potchefstroom; J. B. Quinlan, B.A. M.R.C.V.S., Lecturer in Veterinary Science, Potchefstroom, was transferred to Veterinary Research, at the 31/1/20; G. May, M.R.C.V.S., was seconded from the Veterinary Division to Potchefstroom; Jas. Duffton was transferred from Potchefstroom to Cedara as Farm Manager, as from the 12/2/20; E. Parish, B.Sc., Vice-Principal, was transferred from Elsenburg to Glen, and subsequently to Head Office as Technical Assistant; G. J. Bosman, B.Sc. (Agr.), was transferred from Potchefstroom to Glen, and promoted to post of Vice-Principal; E. Baker, B.Sc., Botanist, was transferred from Cedara to Elsenburg.

Returned from Active Service.—R. W. Thornton, Principal, Grootfontein; F. C. Smith, Lecturer in Ostriches, Grootfontein; H. D. Leppan, Experimentalist, Potchefstroom; A. J. Taylor, Assistant Chemist, Cedara; A. Rose-Innes, Clerical Officer, Elsenburg.

COURSES OF INSTRUCTION.

The attendance at the Schools which had fallen off greatly during the years of the War increased until all available accommodation was occupied at the close of the period under review, including the additional buildings provided for returned soldiers. More applicants are now coming forward than the Schools can accommodate; the advantages of an agricultural education are becoming more widely appreciated, and there is every reason to believe that an era of even greater progress than in the past, is beginning for these Institutions.

The following is a statement showing the numbers in attendance at the different Courses:—

	Cedara.	Glen.	Elsenburg.	Grootfontein.	Potchefstroom.
Diploma Course	—	54	74	71	67
Special Course in Dairying ..	—	—	—	12	—
Special Course in Sheep and Wool	—	—	—	17	—
Special Course One Year ..	—	—	—	—	7
Special Course Returned Soldiers	59	5	19	21	33
Totals	59	59	93	121	107
Winter Vacation Courses ..	—	—	72	157	140
Short Course, Winemaking ..	—	—	20	—	—
Short Course, Normal College Students	—	—	—	—	9
Grand Totals ..	59	59	185	278	256

A recapitulation of the above figures shows the number attending the Diploma Course as 266; Special Courses of 6 months to 1 year's duration, 36; Returned Soldiers' Course, average attendance—1 year, 137; Winter Vacation and other Short Courses, 398; total number of persons who received instruction, 837.

These numbers are apart from men accepted for Training Farms who are reported elsewhere.

It will be observed that Cedara was retained wholly for the instruction of returned soldiers. No special or short courses were given at either Cedara or Glen.

A very heavy year's work was done at the other three Schools which were taxed to their utmost capacity. At Potchefstroom a number of students lived out in the town, as accommodation was not available for them at the Institution. The number of young men who have entered the Two Years' Course is a very encouraging feature of the work. With the re-opening of this Course at Cedara at the beginning of next year, it is estimated there will be in attendance for the regular two years' training some 300 students.

As a result of the examinations held in 1919, the following awards were made:—Elsenburg, 7 Diplomas, 1 Certificate in Agriculture; Grootfontein, 7 Diplomas, 1 Certificate in Agriculture; Potchefstroom, 8 Diplomas; Grootfontein, 14 Certificates in Sheep and Wool, and 5 Certificates in Dairying.

The Special Course in Sheep and Wool given at Grootfontein has proved an unqualified success. The applicants seeking admission to the last course of this kind were many times in excess of the number which could be given facilities for training. The instruction is very thorough and embraces both theory and practice. The Special Dairy Course also held at Grootfontein during the past year has suffered through want of milk supply, and it is proposed to transfer this Course to Glen, where supplies will be more readily obtainable, and where a large and well-equipped Dairy is now ready for use.

The Winter Vacation Courses, which are open to women as well as men, have continued to attract a large attendance, especially at Grootfontein and Potchefstroom. Though of only a few days' duration, from 5 to 16 days, these Courses are the means of disseminating a vast amount of valuable information, and they enable the staff at the Schools to get into touch with many persons to whom the Institutions would otherwise remain unknown.

TRAINING OF RETURNED SOLDIERS.

The training of returned soldiers for agricultural pursuits which had previously been begun by the Department of Lands was at April 1st, 1919, handed over to Agriculture (Education). Up to this date one training farm had been established at Vlakfontein, near Standerton, where 66 men had been carried through a practical Course. This farm did not prove suitable, and was shortly afterwards transferred back to the Department of Lands. The School of Agriculture, Cedara, was given up entirely to the training of returned soldiers, beginning with September, 1918. Fifty-seven pupils were in residence here at the 1st April, 1919.

The object of the scheme was to assist returned soldiers of the Union Forces in gaining a knowledge of agriculture sufficient to enable them to commence farming on their own account. The Diploma Courses of two years at the other Schools of Agriculture were thrown open to suitable men, and others were accepted for a course of a more practical nature extending over one year. For the purpose of this training the accommodation at each School was increased by the erection of a hostel for 30 men, and four new Training Farms were opened, these being Hartebeestpoort, Pretoria District; Beginsel, Standerton; Guba Park, Indwe; and Oakdale, Riversdale, each of which could be used for 35 pupils. The One Year's Course at the Schools comprised both theoretical and practical work, while that given at the Training Farms was mainly of a practical character, which aimed at providing a full season's experience in work which would, necessarily, be undertaken by the ordinary farmer on his own holding. A certain portion of the time was also devoted to attendance at lectures and demonstrations on subjects directly related to the work.

Board and tuition were furnished free, and each man received an allowance of £2 10s. per month as pocket money. Pupils who were married on entering the Course, were paid an additional allowance of £2 10s. per month. The men who have come forward for training were generallly of a good standard of education. They showed keen interest and gave great satisfaction, both in work and conduct. Those possessing the better educational qualifications were naturally attracted to the Schools which were taxed to the utmost. The accommodation at the Training Farms was never wholly occupied, but a very considerable number received a sound training at these institutions. At Oakdale, however, only a couple of men were enrolled and in consequence instruction was not proceeded with there. At the other three farms almost all of the work was carried out by the students and little hired labour was employed. It is very satisfactory to be able to record that practically all men who completed their training have been provided by the Lands Department with land and facilities to start farming operations.

The following statement shows the number of returned soldiers who had received training under this scheme up to June 30th, 1920:—

School or Training Farm.	Total number admitted to 30/6/20.		Total Number still in training as at 30/6/20.		Number discharged as unsuitable.	Number left to take up farming.	Number left for other employment.	Number left on account of sickness or other reasons.	Transferred to other Government Schools or Training Farms.
	Practical.	Diploma	Practical.	Diploma					
Glen	12	35	10	28	1	2	1	2	3
Potchefstroom ..	42	46	26	34	—	23	2	3	—
Cedara	148	—	64	—	4	62	15	1	2
Elsenburg ..	21	52	10	39	2	13	6	1	2
Grootfontein ..	66	33	32	18	2	39	6	2	—
Total ..	289	166	142	119	9	139	30	9	7
Beginsel ..	25	—	18	—	2	4	—	1	—
Indwe	40	—	21	—	3	7	4	2	3
Hartebeestpoort	37	—	18	—	2	9	—	—	8
Total	102	—	57	—	7	20	4	3	11

The grand total of returned soldiers provided with training up to the date mentioned was 557.

EXTENSION WORK.

The following statement shows the advisory work done by the five Schools and also includes 24 lectures and 142 visits to farmers carried out by the Live Stock Officer attached to Head Office:—

Subject.	Enquiries.	Lectures and Demonstrations.	Attendance.	Shows Attended.	Visits to Farms, etc.
Agriculture and Stock ..	44	98	4,058	116	390
Agricultural Chemistry ..	1,520	9	336	9	15
Agricultural Botany ..	236	3	67	4	9
Agricultural Engineering ..	365	—	—	2	11
Entomology..	402	7	404	7	21
Veterinary Science ..	143	—	—	1	28
Dairy	311	3	300	4	16
Poultry	3,754	94	4,592	71	249
Horticulture	915	72	1,028	10	82
Totals for year 1919-20 ..	12,091	286	11,229	224	821
Totals for year 1918-19 ..	11,400	196	8,637	108	781

The records of extension work as given above show an increase in comparison with the previous year. With the development in courses at the Schools, it has been difficult to spare officers for work in the districts. There are abundant opportunities for staffs to render services of this kind and the demands are increasing. The present difficulty of securing suitable officers is the only serious obstacle in the way of a much greater development of extension work, and it must be admitted this is a form of assistance which has a direct bearing on agricultural production and yields the quickest returns.

In addition 126 engagements were filled in judging at Shows, and 20 different exhibits were made.

Assistance was given in the inspection of cattle for the Stud Book, five South Devon herds and one Hereford herd being inspected by the Principal, Cedara.

A very successful Conference of dairy farmers attended by approximately 300 persons, was held at Cedara in April.

A " Poultry Day " at Glen was very well attended. Lectures and demonstrations were given and a comprehensive exhibit of poultry feeds and appliances was prepared.

The Annual Grain Farmers' Conference was held at Elsenburg on the 30th October. About 200 farmers were present. The experimental fields were inspected and several lectures were given.

A Poultry Conference also met at Elsenburg in January. On this occasion there were 250 visitors. A very successful day was spent in listening to lectures and in inspection of the plant. A number of members of the Maize Growers' Association met at Potchefstroom in April for the purpose of inspecting the experiments in maize.

Nine agricultural surveys of proposed railway routes were carried out at the instance of the General Manager of Railways and reports furnished to the Railway Authorities. Five of these inspections in the Transvaal were made from Potchefstroom, and four in the Eastern Province and North-West, from Grootfontein.

Household Science.—One itinerant instructor in Household Science was employed until February, 1920, when Miss Lavecour, who held the post, resigned. There is scope for a great extension of this work, and it will be possible to do much more with the aid of scholars in Domestic Science who have now completed their course in Canada.

Inter-School Judging Competition.—An inter-school judging competition was held at the Central Show, Bloemfontein, in March, 1920, and attracted much attention and favourable comment. Four Schools were represented by teams, namely, Grootfontein, Potchefstroom, Glen and Elsenburg. Three rings were provided and each School was required to compete in two of these.

The result of the competition was in favour of Grootfontein in the following order:—1st, Grootfontein; 2nd, Potchefstroom; 3rd, Glen; 4th, Elsenburg.

At the conclusion of the competition, the Judges, all eminent authorities, commended the students on their work and exhorted them to continue as they had made a sound start on good work.

Maize Growing Competition for School Boys.—The maize competition of the past year was the fifth of its kind which has been conducted from Potchefstroom. One hundred and forty competitors entered of whom 69 completed the trials. The season was unfavourable for maize and the yields obtained were low, averaging about 5½ bags per acre. In some districts the Competitors' plots failed entirely. The boys taking part ranged from 12 years to 16 years. The Witwatersrand Agricultural Society has rendered valuable assistance in providing prizes for best ears from plots shown at the September Maize Show.

Both teachers and pupils have displayed a very commendable interest in the work, and the competition has, undoubtedly, had a beneficial influence in awakening a keener sense concerning agriculture on the part of many boys. By this means too, the use of improved seed and more careful methods of cultivation have been encouraged on many farms.

Analysis of Materials.—There has been a considerable increase in the work done at chemical laboratories during the year. Not only was the number of samples in excess of those received and reported on in the previous year, but a great deal of testing has been carried out in connection with dairy glassware under the regulations of the Dairy Act. The number of pieces of glassware so tested was 10,432.

In the analysis of soils, waters, feeding stuffs fertilizers, tanning and other materials, 920 samples were dealt with and in connection with special departmental work, 522 determinations were made for nitrates, and 108 for lime.

The testing of milk samples for butter-fat was continued, and a certain amount of seed testing was carried out at the Schools.

PUBLICATIONS.

The resumption of publication of the Department's *Journal* will prove of the greatest assistance in placing the results of investigational work before the farming community. For some time there had been much delay in bringing out articles. This difficulty will now be overcome. Many articles were contributed by members of staff to the press during the past year and have not been mentioned in the following list which give the principal publications prepared and issued:—

Cedara:

"Composition and Character of Natal Soils," by C. Williams, B.Sc.
"The Composition of Natal Wattle Bark, Part 3," by C. Williams, B.Sc.
"Calibration of Gerber Butyrometers," by C. Williams, B.Sc.
"Composition and Valuation of Fertilisers and Feeding Stuffs," by C. Williams, B.Sc.
"Rats in Sugar Cane," by S. H. Skaife, M.A., M.Sc.
"Report on Second Egg-laying Competition," by T. B. Cross.
"Geese and Turkeys," by T. B. Cross.
"Report on First Duck Egg-laying Competition, 1918-1919," by T. B. Cross.
"The Sugar Industry in Natal," by E. R. Gessner.
*"Factors in the Natural Control of the Wattle Bagworm," by S. H. Skaife.
*"The South African Entomophthoraceae," by S. H. Skaife.

Elsenburg School of Agriculture:

"Results of Winter Cereal Experiments at Elsenburg," by T. G. W. Reinecke, B.A., M.Sc., Principal, and G. J. Meynhardt, Experimentalist.
  I. Groen Bemesting en Kalk, by T. G. W. Reinecke, Principal.
  II. Bemesting, by T. G. W. Reinecke, Principal, and Dr. J. C. Ross, Research Chemist.
  III. Origin and Properties of Soils, by Dr. J. C. Ross.
    (For Landbouw Serie, Universiteit, Stellenbosch.)

"Pigs and Piggeries," by W. A. K. Morkel, M.Sc., Vice-Principal, and W. S. H. Cleghorne, B.Sc., A.M.I.M.E., Lecturer in Engineering, Potchefstroom.
"Fire Protection Methods," by E. Baker, B.Sc., Botanist.
"South African Standards for Judging Eggs and Live Table Poultry," by W. O. John.
"The Poultry Industry," by W. O. John.
"The Value of Milk and Cream Testing," by F. Joubert, Assistant Dairy Instructor.
"Smuts in Cereals and Methods of Control," by E. Baker, B.Sc., Botanist.
"The Fruit Shed in Relation to the Control of Codling Moth," by Dr. F. W. Petty, Entomologist.
"Parasites of the Codling Moth and their Relation to its Control," by Dr. F. W. Petty, Entomologist.

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* Papers read before the South African Association for the Advancement of Science at Bulawayo.

Grootfontein School of Agriculture:

1. "Lucerne Experiments at Grootfontein School of Agriculture," by J. E. Donkin.
2. "Cereal Variety Tests, 1918," by J. E. Donkin.
3. "Spineless Cactus," by J. E. Donkin.
4. "Cultivation and Hilling of Wheat," by J. E. Donkin.
5. "Hand Rearing of the Dairy Calf," by H. Cooke, B.S.A.
6. "Karakul Sheep," by R. O. Wahl, B.A.
7. "Observations on the Ostrich Feather Industry in England," by F. C. Smith.
8. "Ostrich Farming," by F. C. Smith.
9. "The Ostrich Feather Industry," by F. C. Smith.
10. "Ostrich Farming Handbook," by F. C. Smith.
11. "The Cross Breeding of North African and South African Ostriches," by F. C. Smith.
12. "Breeding and Management of Turkeys," by A. O. John.
13. "Breeding and Management of Geese," by A. O. John.
14. "The Sulphur Requirements of Crops," by Arthur Stead, B.Sc.
15. "Brak in its Relation to Irrigation," by Arthur Stead, B.Sc.
16. "Soil Erosion," by W. Torrance.

Potchefstroom School of Agriculture:

"The Food Value of Willow Leaves," by T. D. Hall, M.Sc.
"Glucose and Starch in Maize," by T. D. Hall, M.Sc.
"Die Uitroeiing van Knaagdiere en andere Ongedierte in die Veld,"—W. F. Schlupp, B.Sc. (Agr.).
"Aphicides—Experiments and Notes on Various Substances," by W. F. Schlupp, B.Sc. (Agr.).
"Mylabris Beetles," by W. F. Schlupp, B.Sc. (Agr.)
"The Best Breed of Dairy Cattle for the High-Veld," by J. P. v. d. H. Schreuder, Ph.D.
"Linseed for Calves," by J. P. v. d. H. Schreuder, Ph.D.
"Dairy Farming," by J. P. v. d. H. Schreuder, Ph.D.
"Calf Rearing," by J. P. v. d. H. Schreuder, Ph.D.
"Power Applied to Agriculture," by W. S. H. Cleghorne, B.Sc., A.M.I.M.E.
"Skatting van die Hoeveelheid Water in 'n Voorgestelde Dam," by W. S. H. Cleghorne, B.Sc., A.M.I.M.E.
"Hoeveelheid Grond in 'n Dam Wal," by W. S. H. Cleghorne, B.Sc., A.M.I.M.E.
"Stoommasjiene en Verbrandingsmotors op die Plaas," by W. S. H. Cleghorne, B.Sc., A.M.I.M.E.
"Monthly Notes on Fruit-growing and Gardening," by H. B. Terry.
"Report on Egg-laying Competition, 1918-19," by R. Bourlay.
"Report of Demonstration on Messrs. Ransomes' Plough," by W. S. H. Cleghorne.
"Report of Demonstration on the Holt Caterpillar Tractor," by W. S. H. Cleghorne.
"Precis of the Report of the Special Committee on Engineering in England," for the *Agricultural Journal*, by W. S. H. Cleghorne.
"Power Applied for Agriculture," by W. S. H. Cleghorne.

EXPERIMENTAL AND INVESTIGATIONAL WORK.

Cedara.—Trials of pasture grasses have given promising results at Cedara. The conditions here appear quite suitable to Kikuyu which is now being planted more extensively.

Co-operative experiments in rotations including maize, teff and cow peas have now been running for four years, and on one farm for five years. A marked increase, approximately 40 per cent. to 50 per cent., has been shown in the maize crop grown after cow peas, and evidence is accumulating to show that farmers should make much greater use of the latter plant, both as a soil improver and a source of fodder.

Experiments in the use of phosphatic manures are also in progress.

Investigations have been continued concerning the composition of wattle bark.

At Winkel Spruit, a sub-station of Cedara, the principal work carried out consisted of trials in cotton, sugar cane, coffee, fibre plants, sweet potatoes, arrowroot, ginger and tropical fruits.

Glen.—Trials in field crops were conducted at Glen, and the Poultry Instructor continued experiments in the building up of egg-laying strains of pure-breds, comprising Speckled Sussex, White Wyandottes and Silver Campines. A very satisfactory increase in egg-production has been obtained as a result of three years' work. White Leghorns and Light Sussex have now been included.

Elsenburg.—An important experiment in the breeding and feeding of pigs was begun early in 1919. It is expected that three years' work will be required in order to secure definite results. Three breeds are being used, Berkshire, Large Black and Tamworth. These are being crossed in various ways in order to test the different types and crosses, and records will be obtained in regard to the consumption of feed and gain in weight at different ages, most suitable feeds and many other points of practical interest to the pig breeder.

Hop experiments have been continued at George. Trials on an extensive scale were made with Salphos or Saldanha Bay phosphate. One interesting result indicated that while the immediate effect of the application of the raw rock phosphate was negligible, continued dressings may exert a considerable influence on crop yields. The control of codling moth and fusicladium in pears was the subject of much careful investigation. Remedies were applied by means of dusting and were also used in the form of a liquid spray. On the whole the latter system has given the best result.

Field experiments which promise to prove of great practical value are in progress with the object of testing different systems of cropping and the use of rotations and fertilizers on soils of the Western Province.

Many varieties of wheat and oats have been tested, especially with reference to rust resistance, early maturity and yield of grain. The Union wheats bred at Elsenburg are becoming increasingly popular. These are early maturing.

In the orchard at Elsenburg, experiments are in progress concerning systems of pruning apple trees and the manuring of the pear orchard. In trials made of plum trees raised on peach stocks and also on Myrobalan plum stock, the results in growth of tree and yield of fruit were much better in the cases where peach stock was used.

Experiments with olives have not been wholly successful, and the tests will be continued.

A comprehensive experiment in manuring has been begun in the vineyard.

Grootfontein.—Co-operative experiments including wheat, Tepary beans, Sudan grass, and Phalaris bulbosa were carried out with 45 farmers distributed over 21 districts. Winter crops for Sheep Feeding were under trial. 5,000 leaves of Spineless Cactus were sold as cuttings and realized £148. Much work has been done in the breeding and testing of wheats. Trials have been made in the South Coast belt with wheats which are most resistant to rust, the application of different fertilizers and testing of different varieties of lucerne. Much important work has been undertaken in the Chemical section, including the investigation of irrigation waters and their colloidal effect on soils, and the question of "brak" in irrigated lands, tests of pine apple soils and the problem of manuring for pine apples.

In the dairy, experiments were made in the pasteurization of milk for cheese-making, the treatment of cream of high acidity for butter-making and the use of special milking buckets to reduce the germ content of the milk.

The Horticulturist, in collaboration with the Chemist, tried the effect of gypsum applied to the orchard soil to prevent injury by "brak" shown by the yellowing of the leaves. The gypsum indicated a beneficial effect. In the propagation of salt bush plants, seed sown in nursery beds in September gave the best results. In a trial of cuttings taken from different parts of the bush the growing tips struck root well and proved much more suitable than the older wood. Almond stocks for stone fruits and blight-proof apple stocks are under test.

Good progress has been made in the breeding experiments with ostriches. A comprehensive article on this subject has recently appeared in the "Agricultural Journal."

The experiments with Karakul sheep are being extended and promise valuable results. A report on this subject has been published.

Potchefstroom.—The experiments in feeding oxen of different types for the oversea market were again undertaken during the winter season of 1919. A comprehensive report dealing with the results of five years' trials is now in course of preparation.

The trials in cross-breeding for the production of early maturing lambs have been very successful. The crosses from the Black Head Persian ewes by a Suffolk ram have reached 40 lbs. dressed carcase when under 6 months' old, with excellent quality.

Extensive experiments were conducted with farm crops, comprising tests of varieties, selection, systems of growth, rotations and fertilizers.

The Research Chemist has mainly devoted attention to the problem of nitrification in soils making over 500 determinations in this connection.

An investigation concerning Mylabris beetles, which are very injurious to fruit, was carried on by the Entomologist. Collection by hand proved the most practical and effective remedy. Much time was also given by this Officer to a study of the bird nuisance as affecting cereal crops. The use of poisoned grain bait is the most promising means of control, but a general scheme of co-operation would be necessary to render the work effective.

The Lecturer in Engineering is engaged in a test of charcoals made from different varieties of Eucalypti used in the production of gas for driving suction gas engines.

In the orchard spraying experiments, chiefly directed against codling moth and apple bark blister, were continued. As the season was unfavourable for fruit, the results obtained from winter and summer pruning were not conclusive though experience gained in summer pruning shows a marked effect in bringing trees into bearing. An interesting and practical result was obtained from the spraying of fruit trees with a thick lime wash.

Blossoming was retarded for 10 to 14 days with different fruits. This, if conclusive, should prove of considerable value to growers, whose orchards are liable to late frosts. Fruit fly was more plentiful than in any previous year.

EGG-LAYING COMPETITIONS.

Egg-Laying Competitions were held at Cedara and Potchefstroom. Both trials were conducted for six months only, as it was found desirable to re-organize the system and the competition of 1918-19 was shortened in order to prepare for a trial of 48 weeks in each year, which will be the period for future tests.

At Potchefstroom 48 pens were entered, there being 5 hens to a pen. Thirty entries were of light breeds and 18 represented the heavy breeds. The highest record in light breeds was 620 eggs, or an average of 124 eggs per hen. The best pen of the heavy breeds produced 530 eggs, an average of 106.

The average production for the 240 hens was 109·3 eggs in six months. The cost of feeding worked out at slightly over 6s. per bird for the period of the test.

The Cedara competition included 120 birds. The winning pen, Utility White Leghorns, gave 543 eggs, an average of 108·6 eggs per hen for 6 months. The highest individual record was 126 full weight eggs.

An egg-laying competition for ducks was begun at Cedara on April 1st, 1920. The egg yield from these birds has so far proved very satisfactory.

NOTES ON FARM WORK.

Cedara.—The rainfall for the year was 29·59 inches. The spring season was dry and both pasturage and crops gave a slow growth. Over 500 acres were placed under summer crops, principally maize and oats, teff and cowpeas. Winter oats and land planted to Kikuyu grass occupied another 100 acres. The average yields were fair. About 400 tons of silage was made. This is not a good maize producing farm, but a return of 6 bags of grain per acre was obtained.

Four breeds of cattle are kept, viz.: Shorthorns, Aberdeen Angus, Friesland and Ayrshire. All have done well, but the results obtained with the Aberdeen Angus have been particularly good. A group of these exhibited at the Rand Show in 1919 and again in 1920 won the Dunne Challenge Cup on each occasion, for the second time with four animals out of the five required, bred at Cedara.

Completed milk records were taken for 18 Friesland cows and heifers. F.14, a ten-year old cow, made a record of 12,550 lbs. milk, 406 lbs. butter fat in 300 days.

The average production of the breed was 9,325 lbs. milk, 299 lbs. butter fat for the year.

Eight Ayrshire cows averaged 5,284 lbs. milk, with 190 lbs. butter fat.

Nine Shorthorns of milking strains gave an average of 8,643 lbs. milk, 296 lbs. fat. Sixty three calves were born of which 58 were reared.

The number of pure-bred cattle on the farm as at the 30th June, 1920, were as follows:—

Shorthorns, 79; Aberdeen Angus, 56; Friesland, 46; and Ayrshire, 28; a total of 209.

At Winkelspruit, a sub-station of Cedara, a rainfall of 47·63 inches was recorded. In addition to experimental work referred to elsewhere, 500 tons of Sugar Cane were cut and sold to the nearest sugar mill. There is a large area which will be ready for cutting during the coming season.

Grootfontein. The area under crops, principally lucerne, oats and teff grass, was 344 acres. The great drought and consequent shortage of irrigation water caused serious damage in the lucerne fields, portions of which will require to be re-established.

Friesland, Shorthorn and Hereford cattle are kept. Crosses of the Hereford bull with common Africander cows have maintained themselves well under the Karroo conditions at Grootfontein. Shorthorns are not considered so hardy as the Hereford. Frieslands have thriven well, but for good results must be well fed and cared for. The stock remained remarkably healthy. Out of 85 calves born, 82 were reared.

An important purchase of a Friesland bull "Craigie Alf," by Admiral Beatty, was made during the year; the price paid was £1,700.

Seven Friesland cows qualified for the advanced registry test, the highest record being made by Zwarte IV., with 17,650 lbs. milk, 3·1 per cent. fat, 568 lbs. butter fat in 300 days.

Catalonian donkeys are still kept, but the number has been reduced by sale and transfer to 19 instead of 38.

The Percheron horses promise to prove very suitable for farm use.

Good progress was made in the Sheep section.

The following stock were on hand: 200 Stud Wanganella sheep; 60 Stud Tasmanian sheep; 220 Stud Karakuls; 200 Karakul crosses; 750 Merino flock sheep.

There was also a flock of 200 Angora goats. The wool was sold in Port Elizabeth during October before prices had reached the highest figures at 57d. for best quality (a record at that date.) Full grown sheep averaged the remarkable return of 35s. per head for wool. Mohair brought 23½d. per lb. for summer firsts. The revenue from this section was £5,560. In spite of drought the sheep on the whole did fairly well. They had an ample range, however,

Ostriches have thriven well, and feathers obtained were satisfactory, notwithstanding the drought. The stock on hand is comprised of 98 adult birds and 59 under 1 year.

Glen.—The season was characterized by extreme drought during the greater part of the period under review. The yearly rainfall was 18·3 inches, more than half of which was received in February and March.

Irrigation water was not available from the river, and winter crops proved a failure. Lucerne also suffered. Over 300 acres were under cultivation. Maize and other summer crops though late, gave a fair return.

Live stock were maintained in good condition. The addition of a small stud of Percheron horses will prove of much assistance in farm work. The breeding of Catalonian donkeys is being continued, but on a reduced scale, only 13 animals being now held.

All three breeds of cattle, Friesland, South Devon and Lincoln Red Shorthorn, have thriven well. A small herd of Africander cattle has also been established here.

Remarkably good records of milk and butter fat yields have been made by Friesland cows entered in the advanced registry test. This herd stood third in the Union for average production among herds tested during the year. The highest yield was obtained from Cow No. 41T, which gave 17,054 lbs. milk containing 529 lbs. butter fat in 300 days. Another cow Jane reached 497 lbs. butter fat and three others gave 456 lbs., 440 lbs., and 408 lbs. fat respectively. Ten cows in all were qualified for the advanced registry.

Two stud flocks of sheep are maintained, Wanganella and Tasmanian. Both breeds have shown satisfactory results. At the 1919 Witwatersrand Show a Tasmanian ram, bred at Glen, secured the Championship.

Elsenburg. The rainfall for the year was 21·25 inches, which is considerably below the average. Seeding was late owing to the rains. About 600 acres were put under crop, principally oats, wheat, maize for silage and grazing crops. The bulk of these crops was used as stock feed. Seeds sold to farmers amounted to 160 bags oats and 90 bags wheat.

The two breeds of cattle kept, Friesland and Jersey, both did well. Flocks of Merino and Suffolk sheep are maintained here and Large Black and Berkshire Pigs. It is worthy of note that the Large Black proved a hardier and more prolific breed than the Berkshire under Elsenburg conditions.

An interesting development in fodder production for the Western Province is the trial with lucerne planted in rows as a dry-land crop. Twenty acres of this crop have been established which is proving very suitable as a pasture for sheep.

The Farm Mariendahl has been devoted to dairying, Turkish tobacco, vineyard and orchard comprising pears, prunes and apricots. The live stock and implements on the farm were included in the purchase. The former consisted of 72 milch cows, 54 dry cows and heifers, 19 calves and 4 bulls.

Twenty-seven tons of grapes were harvested from 15 acres of vineyard. Thirty acres are under fruit trees from which a fair return was obtained.

Potchefstroom.—The winter and spring seasons were dry. Maize germinated well, but portions of the crop required re-planting. Great difficulty was experienced in obtaining a stand of teff. Winter cereal crops were light, especially in the straw as the supply of water available for irrigation was not sufficient unless supplemented by rain. With the aid of periodical rains later in the year good crops of lucerne were raised. Maize recovered as a result of heavy rains in February, and gave an average yield of 8 bags per acre. Some 300 tons of maize were made into silage. The Brakspruit section did not receive a good summer rainfall and the pasturage there was very scanty.

The breeding of Clydesdale horses which are used extensively for farm work was continued. Five breeds of cattle are kept, also a cross-bred herd of Sussex-Africanders. In milk production, the Friesland cows have taken the lead, though several of the Ayrshires have done well; one Ayrshire cow reaching 60 lbs. butter fat in a monthly test. The Sussex cattle are proving well adapted to veld conditions and the bulls cross well with the Africander. The Herefords have not raised their calves so well, being on the average lighter milkers.

The Africander herd which had grown to large proportions has been reduced by the transfer of ten head to Glen.

Good progress has been made in the breeding of stud sheep (Wanganella). The Romney Marsh, also kept at this farm, has not been a success. The increase has not been satisfactory, and the young stock have not grown out well. Very satisfactory results have been obtained in breeding cross-bred lambs by the use of Suffolk rams on the ordinary Black Head Persian ewes. Pigs, Large Black and Berkshire, continue to be bred in large numbers and meet with a ready sale.

SALES OF BREEDING STOCK.

The high prices of the previous year were not maintained, but surplus stock was disposed of at fair values. At the Grootfontein Sale, a larger number of animals was offered including many females and the receipts were almost as large as for the former year.

The following statement affords a comparison of the past three years in this respect:—

	1917.			1918.			1919.		
	£	s.	d.	£	s.	d.	£	s.	d.
Potchefstroom	4,255	3	0	7,438	19	9	3,674	9	6
Grootfontein	5,994	10	0	8,272	11	0	7,374	10	0
Glen	3,889	10	0	5,112	9	0	2,702	0	0
Cedara	1,446	2	3	4,979	0	0	3,849	2	6
Elsenburg	1,813	7	0	2,449	7	0	1,947	5	6
Totals	£17,388	12	3	£28,251	16	9	£19,547	7	6

Including sales of small stock made out of hand the receipts under this head were over twenty thousand pounds.

LABOUR.

Native and coloured labourers are employed at Cedara, the average number engaged being 57, and the average wages, exclusive of rations, amounted to £1 10s. 8d. per month.

At Grootfontein both white and coloured labourers are employed, the number for each class for the year being 18 white men and lads, 8 white apprentices, and 40 coloured employees. The average rate of wages was for white men—6s. per day, and for coloured labourers approximately 3s. per day.

An average of ten white labourers was employed at Glen at a cost of 6s. 6d. per day, and 43 natives at 1s. 8d. per day.

Including the labour for Mariendahl an average of 10 white and 30 coloured labourers were employed at the Elsenburg Institution. The rate of pay was 4s. 6d. for white men and lads, and 2s. 8d. for coloured labourers per day. At Potchefstroom 34 white labourers were employed at 6s. 6d. per day and 27 natives at approximately 2s. per day.

ERECTION OF NEW BUILDINGS AND PLANT.

Little development was possible in the last years of the War and there was much work which was delayed and various new services awaited attention.

The training of returned soldiers rendered additional accommodation for students necessary and a building which could be used for 30 men was erected at each of the five Schools of Agriculture. These Hostels were completed during the year and were immediately occupied. When the returned soldiers' courses have been finished, the buildings may be used for regular students.

A large dairy has been erected and equipped at Glen for use in connection with the special Dairy Course for the training of factory dairymen.

A new dairy has also been provided at Elsenburg, which will greatly improve the facilities for dairy work at that Institution. Three houses for the accommodation of staff have been erected at Glen, and one house at Elsenburg. A silo, capacity 150 tons, was built at Potchefstroom, and several very necessary rondavels were erected for the accommodation of native labourers.

Intensive poultry houses were added at Potchefstroom and Elsenburg.

A considerable portion of the Science fittings and equipment was placed in the educational block at Glen.

The office building at Grootfontein, a wood and iron structure, was totally destroyed by fire on May 24th, 1920. Enquiry failed to discover the cause.

FINANCIAL STATEMENTS.

The cash expenditure under Vote 30—Agriculture (Education) amounted to £117,410 5s. 9d., and the cash revenue was £48,476 14s. 11d. The net cost of this service was therefore £68,933 10s. 10d.

The expenditure exceeded the figures for the previous year (£99,671 2s. 11d.) by £17,739 2s. 10d. The increase was due to an expansion of activities and in part to additions to salaries and higher costs of maintenance. The revenue obtained was practically the same as in the preceding year.

Statements showing particulars of Receipts and Expenditure at each School are as follows:—

No statement can be given for Grootfontein owing to the destruction of the office building, including records, by fire, on May 24th, 1920:—

Cedara School of Agriculture: Statement of Receipts and Expenditure (including Transfers) 1919-20.

Service.	Administration.	School.	Farm.	Dairy.	Poultry.	Horticulture.	Experiments.	Extension Work.	Development and Maintenance of Property.	Total
(*a*) Receipts :—										
Sale of Draught Animals	—	—	729 13 10	—	—	—	—	—	—	729 13 10
Sale, Transfer and Use of Horses	—	—	123 4 6	—	—	—	—	—	—	123 4 6
Sale and Transfer of Cattle and Milk	—	—	4,024 13 9	—	—	—	—	—	—	4,024 13 9
.. .. Pigs	—	—	198 14 2	—	—	—	—	—	—	198 14 2
„ .. Farm Produce	—	—	174 2 2	—	—	—	—	—	—	174 2 2
„ .. Dairy Produce	—	—	—	563 13 5	—	—	—	—	—	563 13 5
.. .. Orchard Produce	—	—	—	—	—	168 7 7	—	—	—	168 7 7
.. .. Poultry and Eggs	—	—	—	—	272 1 0	—	—	—	—	272 1 0
Stud Fees	—	—	32 4 0	—	—	—	—	—	—	32 4 0
Mess Fees	—	475 2 10	—	—	—	—	—	—	—	475 2 10
Fees for Analysis	—	102 15 0	—	—	—	—	—	—	—	102 15 0
.. Testing Glassware	—	157 11 0	—	—	—	—	—	—	—	157 11 0
.. Egg-Laying Competition	—	—	—	—	122 3 0	—	—	—	—	122 3 0
Sundry Receipts	—	14 7	50 19 8	—	3 6	—	—	—	—	51 17 9
Totals (*a*) .. .. £	—	736 3 5	5.333 12 1	563 13 5	394 7 6	168 7 7	—	—	—	7,196 4 0
(*b*) Expenditure :—										
Salaries and Allowances	512 12 4	2.305 15 9	1,043 1 8	61 11 3	220 16 2	158 6 4	800 16 8	936 14 8	290 0 6	6,329 15 4
Transport and Travelling	63 11 0	129 18 8	—	—	—	—	127 2 0	367 15 2	—	688 6 10
Labour	—	498 7 7	1,194 6 2	33 3 4	66 15 0	130 8 9	25 5 5	—	277 13 6	2.225 19 9
Purchase of Draught Animals: Horses	—	—	106 14 0	—	—	—	—	—	—	106 14 0
„ .. Cattle	—	—	72 17 1	—	—	—	—	—	—	72 17 1
.. „ Pigs	—	—	33 8 10	—	—	—	—	—	—	33 8 10
.. .. Poultry	—	—	—	—	15 3 8	—	—	—	—	15 3 8
Foodstuffs	—	—	1,599 5 0	—	251 17 6	—	—	—	—	1.851 2 6
Seeds	—	—	153 10 8	—	—	20 15 7	5 3 10	—	—	179 10 1
Manures	—	—	99 14 2	—	—	19 10 0	71 17 9	—	—	191 1 11
Harness, Trek-gear and Repairs	—	—	42 12 7	—	—	—	—	—	—	42 12 7
Tools and Sundry Equipment	—	—	202 15 6	54 12 9	8 16 3	43 16 1	—	—	—	310 0 7
Implements, Vehicles and Machinery	—	—	155 2 0	—	—	—	—	—	—	155 2 0
Fuel and Light	—	162 17 7	31 4 7	8 10 0	5 3 11	—	—	—	—	207 16 1
Veterinary Medicines and Instruments	—	—	31 18 9	—	1 9 9	—	—	—	—	33 8 6
Purchase and Transfer of Milk	—	—	—	341 16 0	—	—	—	—	—	341 16 0
Permanent Improvement—Trees	—	—	—	—	—	—	—	—	3 4 0	3 4 0
General Repairs	—	—	76 1 0	2 11 0	1 14 6	—	—	—	21 0 1	101 6 7
Incidental Expenditure	—	59 1 6	387 12 0	1 2 0	12 16 5	16 4 5	—	—	—	476 16 4
Provisions	—	2,837 12 10	—	—	—	—	—	—	—	2.837 12 10
Laundry	—	164 10 11	—	—	—	—	—	—	—	164 10 11
Educational Equipment	—	274 19 5	—	—	—	—	—	—	—	274 19 5
Household Equipment	—	132 4 11	—	—	—	—	—	—	—	132 4 11
Medical Attendance	—	50 1 6	—	—	—	—	—	—	—	50 1 6
Less amount recovered from Loan Funds in respect of " Returned Soldier " Students	—	3,057 18 2	—	—	—	—	—	—	—	3,057 18 2
(*b*) Totals .. .. £	576 3 4	3.557 12 6	5,230 4 0	503 6 4	584 13 2	389 1 2	1.030 5 8	1.304 9 10	591 18 1	13.767 14 1

Totals (*a*) include Free Issues and Transfers, £1.228 15s. 6d. Totals (*b*) include Free Issues and Transfers, £1,374 3s. 0d.
As compared with the previous year Revenue shows a decrease of £1,145 11s. 9d., and Expenditure a decrease of £1.772 11s. 4d.
Valuations at the end of the year amounted to Live Stock, £8,867 ; Plant, Equipment and Sundries, £6.941.
Valuations at the end of 1918-19 amounted to Live Stock, £9,644 ; Plant, Equipment and Sundries, £6,926.

Elsenburg School of Agriculture and Experiment Farm: Statement of Receipts and Expenditure (including transfers) 1919-20.

Service.	Administration.	School.	Farm.	Dairy.	Poultry.	Horticulture.	Viticulture.	Experiments.	Extension Work.	Development and Maintenance of Property.	Total.
(*a*) Receipts :											
Sale, Transfer and Use of Horses	—	—	350 0 0	—	—	—	—	—	—	—	350 0 0
Sale and Transfer of Cattle and Milk	—	—	1,625 19 4	—	—	—	—	—	—	—	1,625 19 4
,, ,, Sheep and Wool	—	—	633 19 1	—	—	—	—	—	—	—	633 19 1
,, ,, Pigs	—	—	1,135 6 2	—	—	—	—	—	—	—	1,135 6 2
,, ,, Farm Produce	—	—	799 4 6	—	—	—	—	—	—	—	799 4 6
,, ,, Dairy Produce	—	—	—	476 2 3	—	—	—	—	—	—	476 2 3
,, ,, Poultry and Eggs		—	—	—	261 13 11	—	—	—	—	—	261 13 11
,, ,, Wine and Vineyard Produce	—	—	—	—	—	—	1,244 7 6	—	—	—	1,244 7 6
,, ,, Fruit and Vegetables ..	—	—	—	—	—	382 19 10	—	—	—	—	382 19 10
Stud Fees..	—	—	70 0 0	—	—	—	—	—	—	—	70 0 0
School Fees	—	1,655 14 0	—	—	—	—	—	—	—	—	1,655 14 0
Mess Fees..	—	1,201 10 11	—	—	—	—	—	—	—	—	1,201 10 11
Fees for Analysis	—	26 3 0	—	—	—	—	—	—	—	—	26 3 0
Sundries	—	5 19 6	5 6 6	—	—	—	—	—	—	—	11 6 0
Totals (*a*) .. .. .. £		2,889 7 5	4,619 15 7	476 2 3	261 13 11	382 19 10	1,244 7 6	—	—	—	9,874 6 6
(*b*) Expenditure :											
Salaries and Allowances	622 6 9	3,373 2 9	1,145 14 7	56 6 0	313 2 6	312 14 3	158 4 0	980 11 3	1,187 12 6	337 14 8	8,487 9 3
Transport and Travelling	80 15 6	202 8 4	—	—	—	—	—	161 10 11	483 17 4	—	928 12 1
Labour	—	842 15 2	810 8 9	76 14 8	146 4 7	302 18 9	248 13 10	386 17 9	—	604 7 4	3,419 0 10
Purchase of Draught Animals : Cattle	—	—	167 10 0	—	—	—	—	—	—	—	167 10 0
,, ,, Sheep	—	—	11 7 10	—	—	—	—	—	—	—	11 7 10
,, ,, Pigs	—	—	71 0 0	—	—	—	—	—	—	—	71 0 0
,, ,, Poultry	—	—	56 16 0	—	—	—	—	—	—	—	56 16 0
Foodstuffs	—	—	1,340 7 6	—	277 9 5	12 8	38 10 0	14 12 8	—	—	1,671 12 3
Seeds, Fruit Trees and Vines	—	—	120 12 3	—	—	82 14 11	4 8 2	15 13 6	—	—	223 8 10
Manures	—	—	375 0 11	—	—	21 7 4	64 1 1	54 17 2	—	—	515 6 6
Implements, Vehicles and Machinery	—	—	347 16 7	5 4 0	9 0	4 3 9	4 5 9	25 19 9	—	3 9 10	391 8 8
Harness, Trek-gear and Repairs	—	—	98 2 6	—	—	—	6 0 0	30 14 0	—	—	134 16 6
Tools, and Sundry Equipment	—	—	320 1 11	87 6 3	51 12 7	380 10 11	40 17 10	100 5 3	—	152 3 5	1,132 18 2
Fuel and Light	—	231 8 7	192 15 1	10 8 5	10 13 9	19 16 2	—	4 6 9	—	2 5 0	471 13 9
Veterinary Medicines and Instruments	—	—	28 1 0	—	5 2 10	—	—	—	—	—	33 3 10
Purchase and Transfer of Milk	—	—	—	494 12 9	—	—	—	—	—	—	494 12 9
Permanent Improvements : Fencing	—	—	—	—	—	—	—	—	—	93 13 2	92 13 2
,, ,, Trees	—	—	—	—	—	—	—	—	—	17 9 6	17 9 6
,, ,, Sundries	—	—	—	—	—	—	—	—	—	88 13 11	88 13 11
General Repairs	—	—	67 1 5	—	—	—	—	—	—	—	67 1 5
Incidental Expenditure (including Railage on Stock Sold)	320 7 11	—	314 13 9	—	6 16 8	73 0 0	115 3 11	10 0 3	—	—	840 2 6
Provisions	—	1,509 12 5	—	—	—	—	—	—	—	—	1,509 12 5
Laundry	—	157 11 9	—	—	—	—	—	—	—	—	157 11 9
Educational Equipment	—	547 16 6	—	—	—	—	—	—	—	—	547 16 6
Household Equipment	—	413 16 6	—	—	—	—	—	—	—	—	413 16 6
Medical Attendance	—	29 13 0	—	—	—	—	—	—	—	—	29 13 0
Totals (*b*) .. .. .. £	1,023 10 2	7,308 5 0	5,467 10 1	730 12 1	811 11 4	1,197 18 9	680 4 7	1,785 9 3	1,671 9 10	1,298 16 10	21,975 7 11

Total (*a*) include Free Issues and Transfers, £1,833 19s. 1d. Totals (*b*) include Free Issues and Transfers, £1,815 13s. 9d.
As compared with the previous year Receipts are increased by £1,865, and Expenditure by £2,776, the latter being due to the increased price of all commodities, including labour.
Valuations at the end of the year were : Live Stock. £8,026 10s.; Equipment, £4,379 2s. 6d. ; Stores and Sundries, £3,648 7s.
Valuations at the end of 1918-19 were : Live Stock, £7,085 5s. ; Equipment and Sundries, £7,576 13s.

Glen School of Agriculture and Experiment Farm: Statement of Receipts and Expenditure (including transfers) 1919-20.

Service.	Administration.	School.	Farm.	Poultry.	Horticulture.	Experiments.	Extension Work.	Development and Maintenance of Property.	Total.
(*a*) Receipts.									
Sale of Draught Animals	—	—	13 1 11	—	—	—	—	—	13 1 11
Sale, Transfer and Use of Horses	—	—	481 8 4	—	—	—	—	—	481 8 4
Sale and Transfer of Donkeys	—	—	494 1 10	—	—	—	—	—	494 1 10
,, ,, Cattle and Milk	—	—	1,710 19 11	—	—	—	—	—	1,710 19 11
,, ,, Sheep and Wool	—	—	1,317 0 9	—	—	—	—	—	1,317 0 9
,, ,, Pigs	—	—	147 7 2	—	—	—	—	—	147 7 2
,, ,, Farm Produce	—	—	313 8 7	—	—	—	—	—	313 8 7
,, ,, Fruit and Vegetables	—	—	—	—	54 0 0	—	—	—	54 0 0
,, ,, Poultry and Eggs	—	—	—	291 2 8	—	—	—	—	291 2 8
Stud Fees	—	—	20 0 0	—	—	—	—	—	20 0 0
School Fees	—	1,118 15 0	—	—	—	—	—	—	1,118 15 0
Mess Fees	—	534 19 9	—	—	—	—	—	—	534 19 9
Fees for Analysis	—	10 17 6	—	—	—	—	—	—	10 17 6
Sundries	—	4 1 9	183 11 11	—	—	—	—	—	187 13 8
Totals (*a*)	—	1,668 14 0	4,681 0 5	291 2 8	54 0 0	—	—	—	6,694 17 1
(*b*) Expenditure.									
Salaries and Allowances	571 17 9	2,008 15 2	1,159 4 9	233 0 8	13 16 10	567 2 8	727 16 6	300 0 5	5,581 14 9
Transport and Travelling	58 1 1	155 0 7	—	—	—	116 2 3	340 5 6	—	669 9 5
Labour	—	425 0 6	1,549 1 0	131 15 3	12 12 1	16 10 2	—	887 5 10	3,022 4 10
Purchase of Draught Animals—Horses	—	—	695 0 0	—	—	—	—	—	695 0 0
,, ,, Cattle	—	—	301 13 8	—	—	—	—	—	301 13 8
,, ,, Sheep	—	—	18 9	—	—	—	—	—	18 9
,, ,, Pigs	—	—	—	—	—	—	—	—	—
,, ,, Poultry	—	—	—	20 0 8	—	—	—	—	20 0 8
Foodstuffs	—	—	1,855 6 10	190 8 11	—	—	—	—	2,045 15 9
Seeds and Fruit Trees	—	—	161 2 5	—	—	—	—	—	161 2 5
Manures	—	—	108 4 4	—	—	—	—	—	108 4 4
Implements, Vehicles and Machinery	—	—	170 19 2	8 14 0	—	—	—	—	179 13 2
Harness, Trek-gear and Repairs	—	—	36 14 1	—	—	—	—	—	36 14 1
Tools and Sundry Equipment	—	—	294 7 11	24 11 4	1 8	3 10 9	—	—	322 11 8
Fuel and Light	—	171 4 0	192 2 1	9 9 2	—	—	—	—	372 15 3
Veterinary Medicines and Instruments	—	—	130 0 11	1 13 10	—	—	—	—	131 14 9
Permanent Improvements—Fencing	—	—	—	—	—	—	—	4 14 6	4 14 6
,, ,, Sundry	—	—	—	—	—	—	—	55 3 4	55 3 4
General Repairs	—	—	92 0 9	—	8 3	—	—	—	92 9 0
Incidental Expenditure (including Railage on stock sold)	—	—	523 10 11	11 1 5	—	—	—	—	534 12 4
Provisions	—	1,255 12 8	—	—	—	—	—	—	1,255 12 8
Laundry	—	175 19 3	—	—	—	—	—	—	175 19 3
Educational Equipment	—	155 1 9	—	—	—	18 10 3	—	—	173 11 0
Household Equipment	—	740 9 11	—	—	—	—	—	—	740 9 11
Medical Attendance	—	21 4 7	—	—	—	—	—	—	21 4 7
Totals (*b*)	£629 18 10	5,108 8 5	7,270 7 7	630 15 3	26 18 10	721 16 1	1,068 2 0	1,247 4 1	16,703 11 1

Totals (*a*) include Free Issues and Transfers, £951 7s. 6d. Totals (*b*) include Free Issues and Transfers, £821 15s.

As compared with the previous year Revenue shows a slight decrease and Expenditure an increase of £4,437, due to the fact that this Institution was carrying out its normal functions for the whole year.

The value at the end of the year of Live Stock was, £11,334; Equipment, £5,620; Stores and Sundries, £3,260.

The value at the end of 1918-19 of Live Stock was £12,774; Equipment and Sundries, £7,837.

POTCHEFSTROOM SCHOOL OF AGRICULTURE AND EXPERIMENT FARM: STATEMENT OF RECEIPTS AND EXPENDITURE (including transfers) 1919-20,

Service.	Administration.	School.	Farm.	Dairy.	Poultry.	Horticulture.	Experiments.	Extension Work.	Development and Maintenance of Property.	Total.
(a) RECEIPTS.										
Sale of Draught Animals	—	—	—	—	—	—	—	—	—	—
Sale, Transfer and Use of Horses	—	—	480 8 10	—	—	—	—	—	—	480 8 10
Sale and Transfer of Cattle and Milk	—	—	3,681 13 9	—	—	—	—	—	—	3,681 13 9
,, Donkeys	—	—	—	—	—	—	—	—	—	—
,, Sheep and Wool	—	—	1,108 10 6	—	—	—	—	—	—	1,108 10 6
,, Goats and Mohair	—	—	—	—	—	—	—	—	—	—
,, Pigs	—	—	689 17 4	—	—	—	—	—	—	689 17 4
,, Farm Produce	—	—	298 15 6	—	—	—	—	—	—	298 15 6
,, Seeds	—	—	240 1 10	—	—	—	—	—	—	240 1 10
,, Dairy Produce	—	—	—	420 16 11	—	—	—	—	—	420 16 11
,, Fruit and Vegetables	—	—	—	—	—	240 0 2	—	—	—	240 0 2
,, Poultry and Eggs	—	—	—	—	481 17 11	—	—	—	—	481 17 11
,, Vehicles and Implements	—	—	—	—	—	—	—	—	—	—
Stud Fees	—	—	84 0 0	—	—	—	—	—	—	84 0 0
School Fees	—	3,135 6 8	—	—	—	—	—	—	—	3 135 6 8
Mess Fees	—	536 12 2	—	—	—	—	—	—	—	536 12 2
Fees for Analysis	—	52 2 3	—	—	—	—	—	—	—	52 2 3
Fees for Egg-laying Competition	—	—	—	—	84 0 0	—	—	—	—	84 0 0
Sundries	—	3 0 0	210 4 11	—	2 3 0	—	—	—	—	215 7 11
Totals (a)	—	3,727 1 1	6,793 12 8	420 16 11 †	568 0 11	240 0 2	—	—	—	11,749 11 9
(b) EXPENDITURE.										
Salaries and Allowances	620 11 6	4,350 7 6	2,064 4 4	84 5 7	246 11 10	146 7 3	1,434 1 9	1,714 13 5	273 14 9	10 934 17 11
Transport and Travelling	67 2 10	134 5 8	—	—	—	—	134 5 8	485 14 3	—	821 8 5
Labour	—	418 4 4	2,626 15 10	18 0 0	138 8 4	439 12 9	748 16 3	—	293 6 6	4.683 4 0
Purchase of Horses	—	—	20 0 0	—	—	—	—	—	—	20 0 0
,, Cattle	—	—	491 10 7	—	—	—	—	—	—	491 10 7
,, Sheep	—	—	10 1 0	—	—	—	—	—	—	10 1 0
,, Goats	—	—	—	—	—	—	—	—	—	—
,, Pigs	—	—	—	—	—	—	—	—	—	—
,, Poultry	—	—	—	—	7 12 0	—	—	—	—	7 12 0
,, Draught Animals	—	—	67 5 0	—	—	—	—	—	—	67 5 0
Foodstuffs	—	—	2,460 18 4	—	351 2 0	64 0 7	—	—	—	2,876 0 11
Seeds	—	—	200 7 7	—	—	10 11 4	29 12 2	—	—	240 11 1
Manures	—	—	239 19 7	—	—	—	—	—	—	239 19 7
Implements, Vehicles and Machinery	—	—	325 19 2	—	—	—	—	—	—	325 19 2
Harness, Trek-gear and Repairs	—	—	146 12 7	—	—	—	—	—	—	146 12 7
Tools and Sundry Equipment	—	—	763 3 9	169 14 4	79 9 10	62 18 4	95 7 8	—	—	1,170 13 11
Fuel and Light	—	120 15 1	328 12 3	—	63 2 9	—	—	—	—	512 10 1
Veterinary Medicines and Instruments	—	—	200 16 11	—	2 13 6	—	—	—	—	203 10 5
Milk supplied by Farm to Dairy	—	—	—	284 11 8	—	—	—	—	—	284 11 8
Permanent Improvements—Sundry	—	—	—	—	—	—	—	—	51 2 8	51 2 8
General Repairs	—	—	32 8 6	—	—	—	—	—	—	32 8 6
Incidental Expenses (including Railage on stock sold)	—	20 2 5	703 7 5	—	20 9 9	—	84 18 3	3 8 10	—	832 6 8
Provisions	—	1,567 1 0	—	—	—	—	—	—	—	1.567 1 0
Laundry	—	244 19 8	—	—	—	—	—	—	—	244 19 8
Educational Equipment	—	275 15 9	—	—	—	—	—	—	—	275 15 9
Household Equipment	—	357 15 11	—	—	—	—	—	—	—	357 15 11
Medical Attendance	—	3 0 9	—	—	—	—	—	—	—	3 0 9
Totals (b)	£687 14 4	7,492 2 8	10,682 0 10	556 11 7	909 10 0	723 10 3	2,527 1 9	2,203 16 6	618 3 11	26.400 19 3

(a) Totals include Free Issues and Transfers, £1,416 4s. 11d. (b) Totals include Free Issues and Transfers, £1,511 3s. 2d.

As compared with the previous year the Receipts show a decrease of £3,146 due mainly to lower prices for Live Stock under Expenditure therein, an increase of £649.

Stock on hand at the end of the year was as follows: Live Stock, £15,836; Equipment, £11,932; Stores and Sundries, £3,507.

Stock on hand at the end of 1918-19 was as follows:

STATEMENT SHOWING COST OF MAINTENANCE OF STUDENTS AT EACH SCHOOL OF AGRICULTURE FOR THE YEAR ENDED MARCH 31ST, 1920.

	Elsenburg, 1919-20.			Potchefstroom, 1919-20.			Glen, 1919-20.		
	£	s.	d.	£	s.	d.	£	s.	d.
Provisions	1,509	12	5	1,567	1	0	1,255	12	8
Wages	862	13	11	813	11	9	568	0	1
Household Equipment	413	16	6	357	15	11	290	9	11
Fuel and Light	108	17	3	89	15	1	159	14	4
Laundry	157	11	9	244	19	8	175	19	3
Medical Attendance	29	13	0	103	0	9	21	4	7
Total Expenditure	£3,082	4	10	£3,176	4	2	£2,471	0	10
Deduct Cost of Maintenance of Staff and Accredited Visitors	1,401	10	11	686	12	2	684	19	9
	£1,680	13	11	£2,489	12	0	£1,786	1	1
Average number of Students in Residence	33			52			21		
Giving Cost of Board per Student	£50	11	4	£47	17	6	£85	1	0
Add :									
Estimate in respect of Interest on Capital Expenditure : On Accommodation 5 per cent. on £200	10	0	0	10	0	0	10	0	0
On Furniture, etc., 20 per cent. on £25	5	0	0	5	0	0	5	0	0
Total Cost of Board and Lodging	65	11	4	62	17	6	100	1	0
Deduct Amount paid by each student for Maintenance	50	0	0	50	0	0	50	0	0
Giving nett Cost per Student for Maintenance	£15	11	4	£12	17	6	£50	1	0

WINKELSPRUIT (Sub-Station of Cedara) :—

Receipts.

Sales, principally Sugar Cane	£772	12	8

Expenditure.

Salaries, Wages and Allowances	£499	9	0
Transport and Travelling	16	19	4
Supplies and Services	802	5	8
	£1,318	14	0

It will be observed that the cost of maintaining students at Glen is shown to be much greater than at either of the other Institutions; this may be accounted for by the fact that the Hostel had only been opened. A considerable quantity of new equipment had necessarily to be obtained, and the expenditure including what may be called overhead charges, was divided among a small number of students.

The costs at Elsenburg show a considerable increase over previous years. Potchefstroom makes the most favourable showing, but had the advantage of a larger number of students in residence. No statement can be given for Grootfontein owing to the fire in offices, and the Cedara Hostel was used for returned soldiers and maintained on a different basis.

TOTAL COST OF EDUCATION AT SCHOOLS.

An analysis of the expenditure, including the cost of salaries of staff while engaged in School work, maintenance of hostels, the purchase of laboratory and School supplies, etc., and allowing for deduction of the charge made in fees: £50 per annum, gives the following results for the year 1919-'20:—

Average Attendance.—Elsenburg, 33 ; Glen, 21 ; Potchefstroom, 52.

Net Cost per Student.—Elsenburg, £138 15s. 1d. ; Glen, £154 4s. 2d. ; Potchefstroom, £98 4s. 3d

A comparison of costs for the past three years, shows a steady increase:—

	Elsenburg.	Potchefstroom.
1917-18	£91 0 0 [30]	£53 0 0 [60]
1918-19	100 10 1 [36]	71 9 3 [56]
1919-20	138 15 1 [33]	98 4 3 [52]

The figures in brackets indicate the number of students in attendance.

In conclusion, I desire to place on record my sincere appreciation of the ready manner in which officers of this branch, and especially the Principals of Schools and the Staff at Head Office, have carried out their duties and responded to the many extraneous calls made upon them during the period under review.

E. J. MACMILLAN,
Under-Secretary for Agriculture (Education).

REPORT No. II.

VETERINARY DIVISION.

EAST COAST FEVER.

Transvaal.—In the Transvaal the recent outbreak in the Pretoria district, which has been free from the disease for many years, is the most serious reverse which we have experienced for some time. At the moment there are eighteen centres of infection in comparatively close proximity to the town of Pretoria and while the disease in these centres appears to be well in hand I am by no means satisfied that the worse is past.

In Barberton there have been fourteen fresh outbreaks: two infected farms have been cleared by slaughter and there are now 30 farms in quarantine as compared with 18 last year. In Pietersburg eleven farms have been taken out of quarantine, but as there have been nine fresh outbreaks the number of farms in quarantine to-day is 19, as compared with 15 last year. In Lydenburg, after a lapse of several years, one outbreak has occurred on a farm on the Barberton Border, but as this is in a remote part of the district which belongs to Barberton rather than to Lydenburg, the occurrence of this outbreak has not altered the situation to any great extent. In the Zoutpansberg district, we have been less fortunate as there are now 49 farms in quarantine as compared with 13 last year, but fortunately these are mostly in native areas. In Piet Retief the position remains much the same with 16 farms in quarantine instead of 10 during the preceding year, while in Carolina and Ermelo all quarantines have been withdrawn and these districts are now considered to be clean.

Natal.—In Natal, there have been 115 fresh outbreaks of East Coast Fever as against 73 the previous year, the majority occurring in Vrijheid (15), Klip River (9), Estcourt (12), Ixopo (8), Umvoti (10), Richmond (6), Lion's River (9), Magisterial Divisions. In sixteen divisions no fresh outbreaks have occurred while seven divisions remain free from the disease. Senior Veterinary Officer Power points out that the returns submitted show that no appreciable progress is now being made in the eradication of the disease, though it is being controlled and a satisfactory increase in the number of cattle is taking place.

Transkei.—Strange as it may appear to many, it is in the Transkeian Native Territories that most progress has been made in eradicating the disease, the improvement recorded in my last report being continued. The districts of St. Marks, Tsomo, Nqamakwe, Mqanduli, Xalanga, Elliotdale, Mt. Frere, Mt. Fletcher and Mt. Currie are now free from East Coast Fever. In the Kentani, Libode, Matatiele and Tsolo districts there is now only one infected area in each district. In Mount Frere there are only two centres of infection, while in Idutywa, Butterworth, Engcobo, Willowvale, Ngqeleni and Qumbu, the outlook is good, and excellent headway has been made in Port St. Johns, but the districts of Lusikisiki, Flagstaff, Bizana and Tabankulu are still regarded as wholly infected, although good progress has been made in Flagstaff and Tabankulu. Some headway has been made in the Umzimkulu district, but a good deal has yet to be done before the position can be looked upon as hopeful.

TUBERCULOSIS.

Cape Province.—Here the percentage of reactors found amongst cattle tested prior to being allowed to leave the prohibited areas—Cape and Stellenbosch—remains about the same. The disease is still very prevalent amongst stable cows in these areas and till we are in a position to follow up and destroy all sources of infection we are not likely to have any improvement.

Transvaal.—Nine outbreaks of tuberculosis as compared with three last year were dealt with in this province; 181 animals were tested, three were condemned before test and 28 after test.

Natal.—There were eight outbreaks of this disease in Natal as compared with five last year; sixty head of cattle were tested and eleven reacted.

Orange Free State.—No outbreaks were located in the Orange Free State during the course of the year, as compared with one last year, but as fifty-eight cases of tuberculosis were found at the Johannesburg, Maritzburg and Jacob's (Durban) Abattoirs, among cattle from this province, there is no doubt as to its existence but, owing to the fact that these cattle had passed into the hands of dealers, it was found impossible to locate incontacts.

Transkei.—Two cases of tuberculosis were recorded in the Transkei—the same number as last year—one being at Kokstad and one at Umtata. Both animals were imported Cape cows.

Imported Reactors.—258 head of imported cattle passed through our quarantine stations in the Cape Province and were subjected to the tuberculin test; six reacted and were destroyed, in one of which we were unable to prove the existence of disease. At Durban 174 imported animals underwent the test; of these 17 reacted, in two of which (1 being a calf) no lesions were found on postmortem.

ANTHRAX.

The position with regard to this disease is becoming increasingly serious. In many areas the veld contamination appears to have become so severe that heavy losses are frequently sustained even when owners lose no time in inoculating their stock and repeated inoculations become necessary to check the mortality.

Cape Province.—Anthrax is still prevalent everywhere in this province except in the Karroo, but only a small proportion of the cases are reported. There have been 179 outbreaks reported as against 103 last year, 636 animals have died and 4,354 have been inoculated.

Transvaal.—Here 973 outbreaks have been reported as against 700 last year, 550 head have died and 93,600 have been inoculated.

Natal.—96 Outbreaks of Anthrax as against 54 last year have been dealt with in this province, 413 animals have died and 37,417 head have been inoculated.

Orange Free State.—Anthrax is by far the most serious of all the scheduled diseases in this province, the number of outbreaks and deaths having increased greatly the past 15 months. The number of outbreaks is 378 as compared with 122 last year. 3,545 head of stock have died and 81,950 have been inoculated.

Transkei.—Owing to the indifference of the native to the risks incurred in cutting up Anthrax carcases, which are frequently dissected and eaten, the difficulties of keeping the disease under control are very great. 265 outbreaks as against 125 last year have been diagnosed and 52,887 animals have been inoculated.

GLANDERS.

There has been very little change so far as this disease is concerned. In the Cape the number of outbreaks is 18 as against 16 last year. In the Transvaal there were 8 outbreaks in 1918-19 and 8 during the current year. There was one rather serious outbreak in Natal—nil in the previous year—in connection with which 13 died: all reacted to test and were destroyed and 102 incontacts passed the test satisfactorily. In the Transkei there were only two outbreaks as compared with six last year, necessitating the destruction of eight animals, and in the Orange Free State three outbreaks were dealt with as against five last year; nine animals were destroyed and 33 incontacts tested.

LUNG SICKNESS.

The efforts made by the Bechuanaland Protectorate Authorities to deal with lung-sickness in their territory have fortunately sufficed for our protection and so far as we are aware the Union remains free from disease, which is rather remarkable as cases have occurred right on our northern border.

EQUINE SCABIES. MANGE.

There has been a recrudescence of scabies in the Cape Province, probably owing to the loss of condition amongst equines belonging to a certain class of owner during the recent drought which rendered the animals an easy prey to this disease. One hundred and twenty-nine outbreaks as against 67 the previous year were reported in the course of which 35 animals died and 334 were placed under observation or treatment. In the Transvaal 64 outbreaks as against 71 last year, came to our notice, none of which was extensive. In Natal, there were two as against one the previous year; in the Transkei four as against five the previous year and three in the Orange Free State as against one last year.

EPIZOOTIC LYMPHANGITIS.

There were only four outbreaks of Epizootic Lymphangitis in the Cape Province as against 13 last year, three in Humansdorp and the other at Port Elizabeth. The marked improvement in the situation with respect to this disease is due to prompt destruction of infected equines and thorough disinfection, together with isolation of contacts. In Natal there have been two outbreaks only. No outbreaks have been dealt with in the other Provinces.

SWINE FEVER.

The only outbreaks with which we have been called upon to deal have occurred in the Cape Province and there the position has materially improved owing to the adoption of a stamping out policy. The disease is now believed to have been eradicated from the Somerset East district from which we have been able to remove the quarantine restrictions, while in the Western Province only two outbreaks came under observation, both of which were promptly dealt with. It would not be safe, however, to assume that these were the only outbreaks which have happened. In all there have been seven outbreaks in the course of the year as compared with 11 last year, involving the death or destruction of 496 animals.

DOURINE OR SLAPZIEKTE.

The disease is mainly confined to the Hay, Herbert and Barkly West Districts of the Cape Province, but it is also suspected to exist in the Kuruman and Vrijburg Districts and has been reported in the Boshof District of the Orange Free State, although a certain amount of doubt has been expressed as to the correctness of the diagnosis in the Boshof cases.

RINDERPEST.

We have no information which would lead us to believe that this disease has extended South of the immune belt established along the north of the Nyasaland—Rhodesia Border by the Rinderpest Commission.

NON-PROCLAIMED DISEASES.

"Three days sickness" (Ephemeral Fever) was prevalent in the Midland Districts towards the end of 1919 and led indirectly to the death of considerable numbers of cattle which had become reduced in condition owing to the drought. There has also been a good deal of mortality from what is believed to be Senecio poisoning in areas in which *Senecio latifolius* is abundant.

Several outbreaks of Gallamziekte have also been reported from Sour Veld coastal districts during the early summer months.

Amongst sheep Bluetongue has not been particularly prevalent but several outbreaks of Heartwater have been reported from Somerset East, Albany and Cradock Divisions, probably due to movements of sheep to coastal districts to escape the drought and where they probably picked up infected bont ticks. In the Transvaal nothing special has been reported in the shape of non-proclaimed disease nor has anything of note been reported from Natal. In the Transkei Bluetongue was very prevalent towards the end of the summer and a considerable mortality resulted therefrom as very little inoculation was carried out before the summer commenced. Experiments in Dunziekte or Grass Staggers are being continued at Usherwood near Kokstad with interesting results; muzzled horses running in an area having a bad reputation for this disease, have remained free from Dunziekte but a considerable number of animals so muzzled have developed Osteo Porosis. Wireworm is reported to be very prevalent amongst native sheep and is attended by considerable mortality as the majority of natives take no interest in the remedies placed at their disposal. Horse sickness has been confined to the Port St. John's district where numerous deaths have been reported. In the Orange Free State nothing of importance has been reported.

MEAT EXPORT.

Meat export has been carried on to a limited extent as indicated by the export return attached to this report.

STAFF.

During the year four veterinary officers, Messrs. Harber, Hill, Kirkpatrick and Nelson have resigned and the following have joined the staff: Messrs. Ireland, Henning, J. F. Macintyre, G. McIntyre and J. Donaldson. There are still vacancies on the staff which so far we have been unable to fill.

IMPORTATION OF STOCK.

Owing to the prevalence of foot and mouth disease in the Kingdom of the Netherlands, it has been deemed desirable to prohibit importations into the Union of cattle, sheep, goats and pigs until further notice.

During the year arrangements were made for the admission of Rhodesian cattle into the Union for re-stocking purposes in order to meet the needs of settlers taking up land in the Northern Transvaal where climatic conditions are unfavourable for cattle which are subject to Redwater and Gallsickness. In order to do this, a large camp was fenced in in the vicinity of Liebig's Drift in which the cattle are confined for a month before being released. This arrangement has been largely taken advantage of and is appreciated both by settlers and by Rhodesian stock owners. During the year 67,390 head of cattle have been introduced into the Union for slaughter purposes and 29,991 for re-stocking: details are given in the attached return.

J. D. BORTHWICK.
Acting Principal Veterinary Officer.

EXPORT OF BEEF.

During the 15 months, 78,461 cattle, as compared with 58,011 during 1918-19, were inspected for export distributed amongst the various centres as follows:—

1919-20: Durban, 32,494; Johannesburg, 13,505; Cape Town, 11,287; Pretoria, 5,541; Pietermaritzburg, 11,637; Germiston, 3,563; Port Elizabeth, —; Bloemfontein, 434. Total, 78,461.

1918-19: Durban, 25,219; Johannesburg, 12,646; Cape Town, 8,960; Pretoria, 3,911; Pietermaritzburg, 5,152; Germiston, 1,875; Port Elizabeth, 39; Bloemfontein, 209. Total 58,011.

Quarters Shipped.—1919-20: Ex Durban, 188,691; Ex Cape Town, 39,380. Total 228,071.

1918-19: Ex Durban, 159,225; Ex Cape Town, 42,586. Total, 201,811.

Export of Ham and Bacon.—During the 15 months: 6,492 Bales of Bacon, 3,420 Sides of Bacon, 247,927 Pounds of Bacon, 1,977 Carcases of Pork, 6,404 Pounds of Ham, and 130 Bales of Ham were exported.

Return of Cattle Dipping Tanks.—June 30, 1920: Cape, 1,673; Transvaal, 1,801; Natal, 5,020; Transkei, 784; Orange Free State, 245. March 31, 1919: Cape, 1,591; Transvaal, 1,389; Natal, 4,389; Transkei, 757; Orange Free State, 219.

Return of Cattle Dipping Tanks.—March 31, 1919: Cape, 1,591; Transvaal, 1,389; Natal, 4,389; Transkei, 757; Orange Free State, 219.

Legal Proceedings.

During the 15 months Legal Proceedings were instituted by the officers of this Division in 3,394 cases, resulting in the imposition of fines to the amount of £7,215 15s., and were divided amongst the various provinces of the Union as follows:—

Prosecutions.—Natal, 1,239; Orange Free State, 6; Cape, 417; Transvaal, 695; Transkei, 1,037. Total, 3,394.

Fines.—Natal, £2,636 10s.; Orange Free State, £15; Cape, £1,390 10s.; Transvaal, £1,437; Transkei, £1,736 15s. Total, £7,215 15s.

Importation of Cattle from Adjoining Territories.

During the 15 months, stock was introduced into the Union from the adjoining territories as follows:—

For Slaughter.—Southern Rhodesia, 31,383; Bechuanaland Protectorate, 21,462; South-West Protectorate, 10,720; Swaziland, 3,825; total, 67,390.

For Re-stocking.—Bechuanaland Protectorate, 15,028; Southern Rhodesia, 14,963; total, 29,991.

Return of Livestock imported into the Union from Oversea through the Ports of Cape Town, Port Elizabeth, East London, and Durban during the 15 months ended 30th June, 1920.

Port of Entry.	Cattle.	Horses.	Donkeys.	Pigs.	Sheep and Goats.	Dogs.	Cats.	Zoological Specimens.	Rabbits, Guinea Pigs, etc.	Total.
Cape Town ..	492	149	1	42	1	75	3	1	67	709
Port Elizabeth	26	1	—	2	60	11	—	—	—	87
East London	43	2	—	—	66	2	—	—	—	100
Durban ..	270	69	—	15	847	45	—	—	—	1,199
	831	221	1	59	974	133	3	1	67	2,095

Return of Imported Animals Tested during the 15 Months ended 30th June, 1920.

	Number of Animals.		
	Tested.	Reacted and Condemned.	Percentage.
Great Britain	408	20	4·9
Australia	10	3	30
America	14	—	—

Note.—Out of 831 cattle (one calf) landed only 424 were tested during the year under review, the balance of 407 being accounted for as follows:—140 proceeded direct to Rhodesia, 240 were accompanied by Pirbright certificates, 6 proceeded direct to Onderstepoort, 2 died in Quarantine Station, Cape Town, 19 calves born either on voyage or at quarantine stations. In addition to the above, 8 cattle landed in March, 1919, were tested in April, 1919, thus making a total of 432 cattle tested during the 15 months ended 30th June, 1920.

STATEMENT SHOWING BREED AND SEX OF ANIMALS IMPORTED FROM OVERSEA, 1918-19.

Horses.				Pigs.			Donkeys.		
Breed.	Stallions.	Mares.	Geldings.	Breed.	Boars.	Sows.	Breed.	Jacks.	Jennies.
Thoroughbred	67	127	17	Large Blacks	6	39	Catalonian	1	—
Clydesdale ..	6	—	—	Berkshire	1	1	—	—	—
Shetland ..	1	3	—	White York	4	8	—	—	—
	74	130	17	—	11	48	—	1	—

Cattle.				Sheep.		
Breed.	Males.	Females.	Calves.	Breed.	Rams.	Ewes.
Shorthorn ..	105	202	4	Cheviot ..	—	2
Hereford ..	26	81	14	Merino ..	538	955
Sussex	63	34	—	Shropshire ..	—	1
Angus	86	85	2	Oxford Down	3	—
North Devon ..	27	20	—	Persian ..	—	1
South Devon ..	35	27	—	Romneys ..	10	—
Galway	6	2	—	Wanganellas	77	65
Grade Friesland	2	2	—	South Down	1	6
Ayrshire ..	1	2	—	—	—	—
Red Polled ..	3	2	—	—	—	—
	354	457	20	—	629	1,030

REPORT No. III.

VETERINARY RESEARCH.

ROUTINE WORK.

The correspondence (letters and telegrams) of the Division continued to steadily increase, the figures for the period 1919-1920 at the various Laboratories being as follows:—

	Onderstepoort.	Grahamstown.	P.M.Burg.
Inward	57,007	2,516	14,991
Outward	58,177	935	13,978

These returns show an increase in the correspondence of the Division over 1918-19 as under: Inwards, 20,745; Outwards, 12,302.

Laboratory Products—Vaccines Issued:	1919-20.		
Anthrax, single	284,860	Increase of	34,635 doses over 1918-19.
Anthrax, double..	562,250	Increase of	80,475 doses over 1918-19.
Quarter Evil, single	285,850	Increase of	21,140 doses over 1918-19.
Quarter Evil, double	324,280	Increase of	139,900 doses over 1918-19.
Wire Worm Remedy	6,399,200	Decrease of	1,229,400 doses over 1918-19.
Wire Worm Bowls	1,056	Decrease of	537 doses over 1918-19.
Wire Worm Spoons	5,920	Decrease of	2,943 doses over 1918-19.
Blue-tongue Vaccine	1,089,908	Decrease of	183,912 doses over 1918-19.
Redwater & Gall-sickness Vaccine:			
Onderstepoort	28,408	Increase of	7,274 doses over 1918-19.
Grahamstown	4,824	Increase of	1,454 doses over 1918-19.
Maritzburg	8,294	Increase of	5,393 doses over 1918-19.
Mallein	7,245	Decrease of	655 doses over 1918-19·
Tuberculin (Lond.)	7,496	Decrease of	2,751 doses over 1918-19.
Diagnostic Work—Contagious Abortion:			
Onderstepoort Pos.	75	Decrease of	147 doses over 1918-19.
Neg.	207	Decrease of	814 doses over 1918-19.
Maritzburg Pos.	122	Decrease of	236 doses over 1918-19
Neg.	497	Decrease of	1,017 doses over 1918-19.
Smears and Specimens:			
Onderstepoort	19,186	Increase of	5,802 doses over 1918-19.
Grahamstown	638	Increase of	21 doses over 1918-19.
Maritzburg	12,405	Increase of	2,267 doses over 1918-19.

Staff.—As at the commencement of the financial year:—

Onderstepoort Laboratory.

Mr. R. E. Montgomery	Director of Veterinary Research.
Mr. D. T. Mitchell	Assistant Director of Veterinary Research.
Dr. H. H. Green	Biochemist.
Dr. F. Veglia	Veterinary Research Officer (on active service).
Mr. E. M. Robinson	Veterinary Research Officer.
Mr. G. A. H. Bedford	Economic Entomologist.

Armoedsvlaakte Laboratory, Vryburg.

Sir Arnold Theiler, K.C.M.G.	Director of Lamziekte Research.

Grahamstown Laboratory.

Vacant.

Maritzburg Laboratory.

Mr. W. H. Andrews	Senior Veterinary Research Officer.
Mr. A. O. D. Mogg	Ecologist.

This depleted staff was found inadequate to cope with the increasing work of this Division and strenuous efforts were made to secure Veterinary officers capable of carrying out research work. It was not until towards the end of 1919 that the services of seven men were obtained, who on arrival, were distributed as follows:—Drs. Zschokke, Kind, Scheuber, Sharrer, and Mr. Mettam at Onderstepoort; Dr. Gill at Maritzburg; Dr. Meier at Armoedsvlakte Laboratory.

Dr. P. J. du Toit and Mr. Neser, who returned from their veterinary studies in Europe, were appointed to this Division, the former at Armoedsvlakte and the latter at Onderstepoort.

Mr. Curson was transferred from the Veterinary Division on his return from German East and was appointed at the Laboratory at Onderstepoort.

Mr. Quinlan, transferred from Agricultural Education, took up duties at Onderstepoort in 1920.

Leave of absence was granted to the Director of Veterinary Research, Mr. Montgomery, in September, 1919, and on his return in March, 1920, he resigned from this service to take up duties in British East Africa. Mr. Mitchell was appointed Acting Director during Mr. Montgomery's absence.

RESEARCH WORK.

The various branch laboratories were visited at intervals by the Director, programmes of research work, applicable to the various Provinces were discussed, and visits paid to various field experimental stations.

A tour was carried out through Zululand during July and August of 1919, in company with Mr. Andrews, and enquiries made into the position regarding Trypanosomiasis. A meeting was arranged with the Zululand residents interested, and the Natal Provincial authorities, at Eshowe, on the conclusion of this tour, and methods of prevention were discussed with them.

Horsesickness.—Serum and virus for the inoculation of mules was issued from Onderstepoort to the officers of the Veterinary Division. Altogether 1,920 mules were inoculated with a mortality of 3·11 per cent.

Investigations into the methods of immunising horses were continued and an attempt was again made from October to December to immunise animals at centres in the districts under the control of two officers, Mr. Dunning and Mr. Keppel, who were seconded by the Veterinary Division.

The results were at first very promising, but later the work had to be discontinued on account of staggers from which a high percentage of animals succumbed, after having successfully gone through the immunisation process.

The figures are as follows: Animals inoculated, 633; deaths, 152 or 24·1 per cent.

The inoculation of horses at Onderstepoort in batches of about 50 per month was continued, 392 animals being inoculated, with a mortality of 6·37 per cent.

Investigations into the cause of Staggers in horses, as a sequel to horsesickness inoculation, were initiated, but owing to staff shortage very little progress was made. Mr. Mitchell was in charge of the work on horsesickness.

Lamziekte in Cattle.—Sir Arnold Theiler was asked to return and undertake investigations into this disease at the Armoedsvlakte laboratory. Soon after he took over the control of the investigations, the problem of the cause of Lamziekte was solved by his observing the connecting link between the abnormal craving or Pica and the disease, viz., carrion in the veld. Practical preventive measures were recommended and work on the lines of control of craving by feeding with various chemicals, was instituted with very successful results.

The importance of this discovery cannot be too highly spoken of as it is not only of inestimable value to the Union of South Africa but also throws new light on some problems of stock diseases in other colonial possessions.

Gauwziekte in Sheep.—Experiments at Kaalfontein in the Pretoria district, under Mr. Mitchell, were resumed at the season when the disease occurred. Varying conditions of grazing were imposed on groups of sheep, and feeding tests on about 80 plants, suspected of being implicated, were carried out.

In these experiments Dr. Pole-Evans, chief of the Division of Botany, co-operated.

Indications were obtained during the course of these experiments, that the cause was a plant, botanically known as Vangueria or Sand Apple, and at the end of the season (March, 1920), in consultation with Sir Arnold Theiler and Dr. Pole-Evans, an experiment was arranged which definitely established the culpability of this plant.

Bovine Staggers.—Experiments carried out in Natal on this disease by Mr. Andrews, assisted by Mr. Mogg, Ecologist, resulted in the cause of the disease being proved to be a widely distributed plant, Matricaria nigilifolia. Work on this plant was continued in connection with other species of animals, horses, sheep, goats and pigs without producing any result in these animals.

Contagious Abortion of Cattle.—Investigations in connection with Contagious Abortion in cattle were continued by Mr. Robinson and a vaccine, prepared on the lines of the abortion vaccine of MacFadyean and Stockman was experimented with in order to determine whether the method was applicable to South African conditions.

Several groups of young heifers were inoculated for farmers in different parts of the Union as a practical experiment. The results of the laboratory experiments were distinctly hopeful and if confirmed by the field experiments, should point a way to the successful immunisation of cattle against this disease. The results of the field experiments will not be available before the next calving season.

Research work into the resistance of the infective material under varying conditions was also carried out.

Slapziekte or Dourine in Horses.—Work on this disease was resumed, under Mr. Mitchell, on horses procured from the Kimberley district and many attempts were made to demonstrate the casual trypanosome and isolate it without success. An infected troop of horses was procured and rigidly isolated at Onderstepoort. Young puppies were inoculated from animals developing local lesions with the object of establishing a strain of the trypanosome which could be utilised for diagnostic purposes. So far the results have been unsuccessful.

Stijfziekte in Cattle.—Work on this disease was continued at Lidgetton, under control of Mr. Andrews, assisted by Mr. Mogg. Exhaustive investigations on the botanical side were made by the latter officer, not only of the Lidgetton area, but also of the other areas where a similar or allied disease occurs, viz., Melmoth, Umtunzini and Tweedie.

Evidence was obtained of the close relation of this disease to a certain type of grazing, altered by artificial conditions, such as grass burning or overstocking, and observations to reduce the number of "common-factor plants" were made as a preliminary to further, more detailed, experiments.

Dunziekte in Horses.—The experiments at Kokstad were continued under control of Mr. Andrews, but no definite indications as to the aetiology of the disease could be deduced from the results.

Osteoporosis in Horses.—A few cases of this disease developed among the muzzled lot of horses in Dunziekte experiments and were transferred for further observation and in-contact experiments, to Maritzburg. The experiments were not attended with the success anticipated, but the work is being continued.

Anthrax.—Experiments to procure a more effective and safe vaccine for use in South Africa were continued under Mr. Mitchell and, subsequently, under Mr. Curson, and these new methods were introduced in the work of preparing the vaccine for issue.

An outbreak among horses in the Boshof district, O.F.S., was investigated by Mr. Mitchell, accompanied by the S.V.O., Bloemfontein, and preventive measures recommended, the application of which resulted in the early cessation of the mortality.

Redwater and Gall-sickness Vaccine.—Experiments were continued with regard to the resistance of the causal parasite in the vaccine under varying conditions with a view to the preparation of a more effective vaccine for immunisation of cattle in the districts.

Quarter-Evil Vaccine.—A modification of the method of preparing this vaccine was introduced with a view to making the product more uniform. This process enabled the vaccine to be prepared in a much shorter time, and very good results were obtained from its use in the field.

Mr. Bedford continued his work on insects, associated with diseases in animals, particularily ticks and mosquitoes or night insects in relation to horsesickness.

Various diseases of a local nature were investigated at the different laboratories, among which may be cited the following:—

Chase Valley Disease	Maritzburg.
Specific Pneumonia of Pigs	Maritzburg.
Specific Pneumonia of Calves	Maritzburg and Onderstepoort.
Mortality among Calves (Louws Creek)	Onderstepoort.
Malignant Cattarrh (Snotziekte)	Onderstepoort.
Disease of Equines (Tigerberg, W.P.)	Grahamstown.
Imapunga of Cattle	Grahamstown.
Tick Paralysis in Sheep	Grahamstown.

These investigations are still proceeding.

Numerous tests were also carried out on plants suspected of having a poisonous effect when fed to stock, at the different laboratories.

Many visits which cannot be enumerated here were paid by various members of the staff to farms in connection with diseases under investigation or to investigate local diseases as they occurred.

In spite of the staff depletion at the commencement of the year, and the enormous amount of work of a purely routine nature, necessitating great expenditure of time and leaving little time available for research, it is considered that the Division has a very satisfactory record for the year of research work completed or in progress. The officers who were secured during the year had, necessarily, to spend some time in the country before they became thoroughly acquainted with the stock problems as they occur in South Africa, so that it was only towards the end of the current year that the pressure on the older staff was relieved.

D. T. MITCHELL,
Acting Director of Veterinary Research.

REPORT No. IV.

DIVISION OF SHEEP.

Scab Eradication.

Staff and Appointments.—Staff changes: Sheep Inspectors, 1/4/19 to 30/6/20—Resigned, 52; dismissed, 7; died, 4; superannuated, 8. Staff at 30/6/20: 1 Principal, 26 Seniors, 388 Area and 45 itinerant Inspectors.

Legislation. The amended Scab Regulations published under Government Notice 1703/19 came into force on the 1st January, 1920.

The principal features in these Regulations are:—

1. The definition of "Authorised Dip," viz., Lime and Sulphur.
2. All dippings in protected areas to be done under official supervision.
3. Movements into protected areas are subject to permits from Inspectors of such areas on owners' guarantee that the stock are free from scab and on entry are twice dipped under official supervision.
4. The right of subjecting sheep to a third dipping if considered necessary.
5. Monthly lists of scab infected properties furnished by Inspectors to the Magistrate of his particular district.

Compensation.—Claims paid for loss of sheep, proved as a direct result of dipping sheep in the authorised dip and under Inspector's supervision, amounted to £60 10s., comprising 2 claims.

Protected Areas.—With a view to safeguarding districts free from scab and those that have become free from the disease through compulsory dipping, several districts were gazetted protected and semi-protected.

Stock moved from the latter into the former require to be dipped on entry.

The number of districts protected in each of the Provinces is as follows:—

Protected.—Transvaal 5, Orange Free State 9, Cape 14, Natal nil.

Semi-protected.—Transvaal 1, Orange Free State 2, Cape 39, Natal 5.

Compulsory Dippings.—This work was undertaken principally by the Itinerant staff and was applied to 6 districts in the Orange Free State, 5 in Natal, 1 in the Transvaal, and 18 in the Cape, comprising in all a total of 1,873,235 sheep dipped.

Statistics.—The attached statement (No. 1) gives the total number of stock in the Union and flocks quarantined during 1919, as well as number of flocks quarantined during the period 1st January to 30th June, 1920.

Owing to the severe drought farmers were obliged to trek with their stock from one district to another in search of grazing and water and, in many instances, the dipping of such stock when infected had to be postponed owing to lack of water and the impoverished state into which the animals had got, thus spreading the disease to other districts.

Removal of Infected Flocks.—A number of illegal movements have taken place both by road and rail as will be seen from the statements below:—

(*a*) Stock travelling by road found infected during the year 1919.

	Flocks.	Sheep.	Goats.
Cape Province	396	276,061	37,642
Transvaal	150	82,517	62
Orange Free State	32	19,045	79
Natal	132	66,900	75
Total	710	444,523	37,858

(*b*) Comparative statement of small stock received at the Johannesburg and Maitland Abattoirs and number and percentage of infected stock:

Year.	No. of Sheep and Goats.	No. of Quarantined Stock.	Percentage of Infected Stock.
Johannesburg :			
1911	717,545	81,891	11·41
1912	801,075	77,970	9·73
1913	791,962	57,489	7·25
1914	774,794	25,427	4·57
1915	738,058	49,335	6·68
1916	673,558	28,594	4·24
1917	660,306	50,963	7·71
1918	635,223	39,402	6·20
1919	671,572	49,267	7·33
Maitland :			
1914	256,068	24,426	9·50
1915	293,258	29,448	10·04
1916	302,601	41,562	13·73
1918	277,180	65,670	23·69
1919	290,656	60,167	20·70

At Pretoria Abattoirs 2,033 consignments of 150,503 sheep and goats were received, of which 1,807 sheep and goats or 1·20 per cent. were infected.

The high percentage of infected sheep received at Maitland is principally due to the drought and introduction from the North-Western Districts of the Cape Province, which are still the most infected in the Union, and should be declared isolation areas as previously recommended.

Dipping Tanks.—On the 31st December, 1919, there were 32,921 permanent and 4,159 portable sheep dipping tanks in use in the Union, distributed as follows:—

Permanent Tanks.—Cape Province, 16,259; Transvaal, 3,910; Orange Free State. 10,391; Natal, 2,361.

Portable Tanks.—Cape Province, 1,177; Transvaal, 2,015; Orange Free State, 289; Natal, 678.

The dipping tanks provided during the year 1919 are as follows:—

Permanent.—Cape, 279; Transvaal, 269; Orange Free State, 119; Natal, 65; total, 732.

Portable.—Cape, 97; Transvaal, 75; Orange Free State, 22; Natal, 46; total, 240.

Sheep and Wool.—The past season now under review has been of unique experience for everyone connected with the sheep and wool industry. Growers whilst suffering heavy losses through the unparalleled drought, were, to a certain extent, compensated by the abnormally high prices obtained last year for wool and mutton, and small stock generally. Records have been made in the sale of each of those products, viz., 85d. per lb. for grease wool, £5 5s. per head for merino hamels, and mutton sold at 1s. 11d. per lb. retail. Of course, these are extreme prices, but the average returns over the whole Union for products of the industry have tended to make farmers keener than ever in their endeavours to produce high class sheep and wool. Unfortunately in February last a reaction set in and since then a gradual decline of prices for wool has prevailed and at present our market is overstocked with wool for which there is little or no demand.

Staff Changes.—Mr. C. Mallinson having reached the retiring age resigned his position as Principal Sheep and Wool Expert of the Union during last year. The vacancy created by his resignation has been filled by Senior Sheep and Wool Expert, A. G. Michaelian.

It is also regretted to report the resignations of Messrs. Spies, Schuurman and Pickles.

During the year under review two of the vacancies have been filled by Messrs. Loxton and Visser, two South African students, who qualified in Australia.

Sheep and Wool Experts, 1/4/19 to 30/6/20—Resigned, 4; dismissed, nil; died, 1; superannuated, nil; appointed, 2. Staff at 30/6/20—1 Principal, 1 Senior, 4 Sheep and Wool Experts.

During the period under review the demand for Sheep and Wool Experts as judges and lecturers at the various Shows has been very great. The claims of the various Agricultural Schools in the Union for Lecturers and Demonstrators have also been met to a great extent, but this only at the expense of field work. When flocks are culled, graded and mated efficiently (and this can only be done by expert knowledge) the results always tend to increased quality and monetary returns in the flocks and studs.

Work Performed by Experts.—During the year 1919 the Sheep and Wool Experts visited 1,670 farms and classed and mated 496,911 sheep; demonstrations in shearing and classing of wool were given at 92 shearing sheds. They judged at 96 shows and gave 425 lectures and demonstrations at farmers' meetings and Agricultural Schools.

The Exhibit of South African Products.—I regret to report that the Wool Exhibit at our Trade Commissioner's Office in London is not as representative and as good as it ought to be. This is no fault of the Acting Trade Commissioner. He is doing everything in his power to put up a good show. Farmers having helped us considerably in the past with exhibits free of cost for our local shows, I feel diffident to ask them to furnish the exhibits in London as well. Funds should, therefore, be provided by Government for the purchase of a really representative exhibit of wool produced in South Africa.

There still exists considerable prejudice against South African wools, and if this is to be overcome manufacturing countries of the world must be shown what is being produced.

Mohair.—As in the case of wool the mohair market has declined considerably, and at present there is very little demand for this commodity.

Exports of Wool, Mohair, Skins and Mutton.—Annexure No. 2 gives the particulars of wool, mohair, skins and mutton exported during the year 1919, and the countries to which exported, and Annexure No. 3 shows the exports of these commodities during the 7 years 1913-1919, and the average prices obtained per lb. in those years.

In conclusion it is desired to express appreciation of the assistance rendered to the Division by farmers, wool merchants and wool brokers throughout the Union, by officials of other Departments of State, and by the Field officers and clerical staff of the Division.

B. ENSLIN,
Chief, Division of Sheep.

STATEMENT No. 1.

Province.	Total number of Stock on 31st December, 1919.					Total.	Number of Stock lost through disease.
	Flocks.	Wooled.	Crossbred and Others.	Angora.	Others.		
Cape of Good Hope (including Transkei and Bechuanaland) ..	134,901	14,603,003	4,008,273	2,350,361	3,999,263	24,960,900	773,607
Transvaal	45,238	3,641,326	680,684	68,627	1,109,398	5,500,035	257,432
Orange Free State ..	25,161	8,661,230	410,716	114,151	100,235	9,286,332	214,641
Natal	38,931	1,713,043	383,028	49,395	1,024,863	3,170,329	102,671
Union of South Africa..	244,231	28,618,602	5,482,701	2,582,534	6,233,759	42,917,596	1,348,351

Province.	Number of Stock lost through drought.	Number of Stock dipped under supervision of Inspectors.		Number of Flocks Quarantined.					
				1919.			Half year ended 30/6/20.		
		1919.	Half-year ended 30/6/20.	Local.	Contact.	Introduced.	Local.	Contact.	Introduced.
Cape of Good Hope (including Transkei and Bechuanaland)	2,206,042	6,478,939	4,055,819	7,983	1,140	1,367	4,183	488	691
Transvaal	170,277	1,159,930	514,825	2,934	2,236	446	986	576	202
Orange Free State ..	787,445	879,904	886,167	1,927	352	530	1,034	187	220
Natal	49,029	591,505	299,432	1,273	309	270	628	153	120
Union of South Africa	3,212,793	9,110,278	5,756,243	14,117	4,037	2,613	6,831	1,404	1,233

STATEMENT No. 2.—EXPORT OF WOOL AND SKINS, ETC.

The following quantities of wool, mohair, skins and mutton were exported during the year 1919 :

WOOL.

Destination.	*Lbs.*	*Value.*
Scoured.		
United Kingdom	9,930,055	£1,771,865
Canada, Dominion of	289,648	63,426
Belgium	1,719,464	378,800
France	542,028	94,147
Holland	119,100	28,872
Japan	3,284,338	531,664
United States of America	10,780,149	2,104,144
	26,664,782	£4,972,918
In the Grease.		
United Kingdom	68,090,618	5,263,200
Canada, Dominion of	130,757	8,464
Falkland Islands	1,067	35
Belgium	7,749,305	650,205
France	8,039,801	555,329
Holland	232,590	27,554
Italy	43,002	5,700
Japan	30,416,825	3,174,756
United States of America	43,559,239	3,260,927
	158,263,204	£12,949,170

MOHAIR.

United Kingdom	14,415,195	1,349,278
Japan	24,493	2,741
United States of America	2,502,363	302,216
	16,942,021	£1,654,235

SKINS.

Destination.	Lbs.	Value.
Sheep Skins.		
United Kingdom	27,678,254	£1,719,718
Canada, Dominion of	1,284	85
Australia, Commonwealth	5,583	876
South-West Africa Protectorate	8	1
Belgium	1,210,962	97,750
France	48,289	2,158
Holland	804,691	56,106
Japan	6,129	442
United States of America	10,020,168	949,917
	39,775,368	£2,827,053
Goat Skins.		
United Kingdom	6,319,047	540,697
Australia, Commonwealth of	58,158	10,599
South-West Africa Protectorate	41	15
France	1,155	266
United States of America	5,566,164	525,016
	11,944,565	£1,076,543

MUTTON.

United Kingdom	42,165	1,572
St. Helena	500	25
Madagascar	17	1
Portuguese East Africa	3,248	108
	45,930	£1,706

The total value of wool, mohair, skins and mutton exported during the year 1919 is :

Wool	£17,922,088
Mohair	1,654,235
Skins	3,903,596
Mutton	1,706
	£23,481.625

STATEMENT No. 3.—COMPARATIVE STATEMENT showing quantity and value of Wool, Mohair, Skins and Mutton exported from the Union during the years 1913 to 1919 and average prices per lb.

WOOL.

Year.	Washed Wool.			Scoured Wool.			Grease Wool.		
	Quantity Lbs.	Value. £	Average Price in Pence. per lb.	Quantity. Lbs.	Value. £	Average Price in Pence. per lb.	Quantity. Lbs.	Value. £	Average Price in Pence. per lb.
1913..	70,850	4,832	16·36	3,658,260	269,932	17·70	173,242,755	5,444,524	7·54
1914..	134,305	9.575	17·11	4.323,215	328,073	18·21	129,523,215	3,900,557	7·23
1915..	87,261	7,926	21·80	8.662,792	618,903	17·14	161,253,130	4,753,202	7·07
1916..	203,189	13,709	16·19	10.297,277	1,003,696	23·39	125,894,725	5,583,971	10·64
1917..	11,378	658	13·88	11,935,868	1,804.647	36·29	105,709,896	6,977,065	15·84
1918..	—	—	—	15,242,881	2,792,124	43·96	100,391,617	6,897,506	16·48
1919..	178,015	30,818	41·54	26,476,900	4,939,543	44·77	158,263,204	12,946,170	19·63

MOHAIR.

Year.	Quantity. Lbs.	Value. £	Average price in Pence per lb.
1913	17,355,882	876,255	12·11
1914	18,865,743]	834,202	10·62
1915	16,304,378	687,635	10·12
1916	17,374,068	1,115,281	15·41
1917	3,690,828	280,636	18·25
1918	19,645,684	1,641,889	20·06
1919	16,942,021	1,654,235	23·43

SKINS.

Year.	Sheep Skins.			Goat Skins.		
	Quantity. Lbs.	Value. £	Average Price in pence per lb.	Quantity. Lbs.	Value. £	Average Price in pence per lb.
1913	32,196,400	889,611	6·63	9,104,691	325,936	8·59
1914	30,353,731	753,273	5·95	7,941,096	270,170	8·16
1915	37,226,422	827,590	5·33	8,304,792	264,875	7·65
1916	30,410,386	1,084,042	8·55	8,513,363	414,777	11·69
1917	24,941,141	1,431,852	13·78	4,462,879	362,626	19·50
1918	25,284,318	1,329,236	12·62	5,888,351	405,369	16·52
1919	39,775,368	2,827,053	17·06	11,944,565	1,076,543	21·63

MUTTON.

Year.	Quantity. Lbs.	Value. £	Average Price in Pence per lb.
1913	26,382	619	5·63
1914	107,963	2,266	5·04
1915	319,897	7,516	5·64
1916	768	18	5·63
1917	512	15	6·09
1918	348	7	4·83
1919	45,930	1,706	8·91

REPORT No. V.

DIVISION OF ENTOMOLOGY.

1. *General.*—A report on the lines of those submitted in previous years was prepared promptly when due for the financial year 1919-1920; but, it having been decided (many months later) that divisional reports must be merely very brief resumés, the original draft has been withdrawn and this short report submitted in compliance with the revised instructions. The various recommendations and suggestions made in the 1918-1919 report still hold good. Many investigations are carried on, but results on them are published in bulletin form or as notes in the Department's *Journal*, and hence are omitted from mention in this report.

2. *Staff.*—There has been no alteration in the status or location of the several entomologists. This Division suffered a heavy loss in October (1919), in the death of A. E. Kelly, Senior Nursery Inspector. The post was filled by the promotion of J. Hodgson, Nursery Inspector, to whose vacated post J. P. van der Vijver has been appointed. G. Walter, long Plant Inspector at Port Elizabeth, was retired on reaching superannuation age and H. J. Bishop has taken his place. R. H. Harris has been appointed Assistant to Entomologist at Durban, and W. R. Birch, to a like position at Cape Town vacated by the resignation of Capt. S. M. Wood. At the termination of the period reviewed Entomologist J. C. Faure resigned to become Lecturer in Entomology at the Transvaal University College; and since then Entomologist Dr. C. K. Brain has resigned to accept the post of Professor of Entomology in the University of Stellenbosch. The latter resignations have seriously affected the Division's efficiency. The posts will have to be filled by inexperienced officers.

3. *Publications.*—The leading publications from the Division during the year were:—

The Fig and Willow Borer, by D. Gunn, in Bulletin 6, 1919, 22 pages, 6 plates.

The Wing Venation and Respiratory System of certain South African Termites, by C. Fuller, in Annals of the Natal Museum IV. 1, May, 1919, 84 pages, 9 plates.

The Coccidae of South Africa, III., by C. K. Brain, in Bulletin of Entomological Research IX., 3, 1919, 42 pages, 5 plates.

The Coccidae of South Africa, IV., by C. K. Brain, in Bulletin of Entomological Research X., 2, 1920, 33 pages, 8 plates.

4. *Nursery Inspection.*—The total number of plant nurseries registered for the nursery year September, 1919—September, 1920, is the same as for the previous year, 358; the distribution, however, is slightly different, namely, 193 in the Cape Province, 108 in the Transvaal, 32 in Natal, and 25 in the Orange Free State. The largest fruit tree nurseries remain in the Cape Province, but there are now several important and relatively high class citrus nurseries in the Transvaal. The Cape for the year reviewed is credited with about three-fourths of the deciduous fruit trees and two-thirds of the citrus trees produced in the Union. The total acreage reported under nursery stock was 548.

5. The number of different classes of nursery plants reported by nurserymen as expected to be ready for sale during the year compared with the number for the previous year was as follows:—

	1918-1919.	1919-1920.
Deciduous Fruit Trees	2,128,497	2,231,940
Citrus Fruit Trees	434,059	517,912
Other Fruit Plants (small fruits, mangoes, guavas, etc.)	67,880	73,090
Vines (for unrestricted trade)	1,167,122	1,439,090
Forest and Shade Trees	14,971,292	20,512,850
Hedge Plants	1,232,525	1,373,480
Roses	470,600	352,495
Woody Ornamentals	246,642	254,955
Palms	144,350	97,524
Green House Plants	200,455	189,870

The total worked and unworked fruit trees not expected to reach saleable condition for the two seasons was estimated by the nurserymen to be:—

Deciduous Fruit Trees	2,087,450	2,217,500
Citrus Trees	593,230	1,072,050

The figures given for 1918-1919 are corrected ones. The relatively slight increase in deciduous fruit tree stock was due largely to the protracted dry weather in the south-western Cape during the winter of 1918. The aggregate of saleable citrus stock is still depressed by the destruction of the Rustenburg area citrus nurseries on account of citrus canker, but the relatively large number of young plants now registered presages a large increase over all previous figures in the coming year. The decrease in palms is largely due to the very low return from one Natal nursery that formerly carried much the largest stock in the Union.

6. The returns for forest trees show a large increase, over two-thirds of which is credited to the Transvaal. The figures registered for the several provinces may be of some interest for future reference; they are:—

	1918-1919.	1919-1920..	Increase.
Cape Province	2,513,722	3,517,700	1,003,978
Natal	3,246,000	3,301,150	55,150
Transvaal	6,276,020	9,994,950	3,718,930
Orange Free State..	2,935,550	3,699,050	763,500

Total increase 5,542,558

7. The heavy burden of inspection work is in connection with citrus trees, and red scale continues to be the chief pest. On the whole the nurseries were less infested than in the previous year, an improvement due in part to less favourable climatic conditions for scale but more to better labour conditions. The number of new quarantines applied during the year was 21 against 54 in the previous year. Of the 21, 14 were applied for red scale alone and four others partly on account of this pest. Two were applied solely and two others partly for pernicious scale. One was applied solely for circular purple scale. At the close of the year, 18 quarantines were in force including two applied in the previous year; a list of these has been submitted for publication in the official Journal of the Department.

8. There is still an acute shortage of apple stocks, particularly in the eastern half of the Cape Province, where prolonged drought made sad havoc in many nurseries. The Nurserymen and Seedsmen's Association of the Union of South Africa held a meeting at King William's Town in December, and adopted a resolution requesting the Department to relax the prohibition on blight-proof apple stocks for a season or two; the Department after much consideration, however, concluded to retain the prohibition. At the same meeting, a resolution requesting the Government to impose on nurserymen a registration fee of £5 per annum was carried unanimously.

9. *Plant Import Regulations.*—The importation of plants is still small, largely owing to conditions brought about by the war. The introductions during the year, according to the inspection reports of the several port officers, were as follows, the main figures referring to the number of plants and the figures in brackets to the number of consignments:—

Kind.	Cape Town.	Port Elizabeth.	East London.	Durban.	Johannesburg and Pretoria.	Total.
Fruit Tree Stocks:						
Pear	152,000 (5)	—	—	—	—	152,000 (5)
Plum	13,000 (2)	—	—	—	—	13,000 (2)
Cherry	16,000 (2)	—	—	—	—	16,000 (2)
Fruit Trees ..	345 (3)	—	—	71 (6)	191 (5)	607 (14)
Fruit Trees (Scions)	36 (1)	129 (1)	—	—	—	165 (2)
Bush Fruit Plants	32 (2)	—	—	195 (2)	148 (5)	375 (9)
Grape Vines ..	—	—	—	10 (1)	—	10 (1)
Strawberry Plants	210 (3)	—	—	—	500 (2)	710 (5)
Roses	160 (7)	216 (3)	64 (3)	649 (3)	136 (3)	1,225 (19)
Ornamental Shrubs, etc.	768 (9)	—	121 (3)	1,785 (7)	306 (3)	2,980 (22)
Osier Cuttings ..	600 (2)	—	—	50 (1)	—	650 (3)
Palms	3,774 (8)	500 (1)	—	1 (1)	225 (1)	4,500 (11)
Carnations	6,466 (21)	2,550 (3)	100 (1)	27,868 (11)	2,284 (7)	39,268 (43)
Chrysanthemums ..	390 (7)	—	—	687 (3)	114 (3)	1,191 (13)
Other Soft Plants ..	5,166 (38)	1,250 (1)	351 (4)	331 (13)	280 (8)	7,378 (64)
Manioc Cuttings ..	—	—	—	1,061 (2)	—	1,061 (2)
Sugar Cane Cuttings	—	—	—	17 (1)	—	17 (1)
Bulbs	141,356 (44)	57,815 (5)	?	94 bxs. (45)	?	?

10. No alterations in the restrictions on imports of plants were made; but in January maize seed and barley seed were added to the list of articles that may not be introduced without a special permit in each case. On the recommendation of the Botanist, the Department has since issued a notification that permits will be given only in respect of small lots of maize and barley intended for sowing.

11. The finds of insects and evidence of disease on imported plants were few during the year. As usual a variety of objectionable inclusions were discovered with fruit tree stocks from France. In one consignment of 22,500 stocks, 590 plants with crown-gall swellings were taken while several earthworms and sowbugs and many mites were also observed. In another, one of 80,000 pear stocks, there were 125 with crown-gall swellings and a number infested with living scale insects identified as *Aspidiotus pyri* Licht., *Epidiaspis betulae* Sign., and *Pulvinaria betulae* (L.) Sign. Some of the plants were quite badly infested. There was also a trace of a woolly aphid on the roots, several caterpillars and a number of sowbugs as usual. On some camellias that arrived at Cape Town from the Yokohama Nursery Co., Japan, there were two scale insects, the mining scale *Howardia biclavis*, and the wax scale *Ceroplastes ceriferus*; and on bamboos from the same source there was a species of *Odonaspis* scale. At Durban there was found crown-gall on a few rose plants, and black scale *Saissetia oleae* on chrysanthemums from Australia, greedy scale on plants from Mombasa, the scales *Howardia biclavis* and *Chrysomphalus personatus* and an unrecognized species on plants from Java, and the *Odonaspis* scale already referred to on Arundaria from Japan; while with a few special sugar cane cuttings from Mauritius there were mealy bugs, *Pheidole* ants, and earwigs. The *Odonaspis* was also found by the Johannesburg inspector on Arundaria from Japan; and in the same consignment *Aulacaspis pentagona* scale was found on cherry.

12. The importation of fresh fruit from oversea has not picked up as was expected, oversea prime cost and shipping difficulties being still a serious detriment to the business. The chief commercial importations consisted of five consignments aggregating 2,658 cases of Australian apples landed at Durban and one of 200 cases landed at Port Elizabeth; and one lot of 300 barrels of Spanish grapes at Cape Town and one of 30 barrels at Durban. A total of 463 cases of apples from two of the Durban consignments was excluded on account of Fusicladium spot.

13. The introduction of potatoes was also far below expectations. The arrivals inspected were as follows:—

	Capetown.	Port Elizabeth.	East London.	Durban.	Total.
No. of Cases	2,304	1,746	2,622	462	7,134
No. of Consignments	5	7	5	5	22

The surrender of prescribed documents with reference to warty disease continues to be a requirement for the admittance of consignments, but no precautionary fumigation or other routine treatment is now practised and potatoes would only be excluded because of the absence of the necessary documents or the presence of warty disease, bacterial malady, or some quite unusual disease of suspected grave importance. A number of the consignments admitted this year from England and Ireland were considerably affected with corky scab, *Spongospora subterranea*.

14. *Plant and Fruit Removal Regulations.*—There was no alteration in the plant traffic regulations during the year. The restrictions on the removal of apples, pears, and quinces into certain areas are now of no practical value for their purpose, that of retarding the spread of the codling moth, but the time has not seemed opportune to try to effect their annulment. There were no prosecutions for any contravention during the period reviewed.

15. The remarks made in the last report about the in-transit inspection of plants apply now with as much force as ever. The inspections recorded numbered as follows:—

	Capetown.	Durban.	Port Elizabeth.	East London.	Johannesburg.	Pretoria.
Postal Sendings	14	2	—	2	47	109
Railway Sendings	24	16	15	11	113	90
Sendings Fumigated	11	1	11	1	30	47

Particular care continues to be exercised over the sendings of plants from Pretoria owing to the local prevalence of the dreaded pernicious (San Jose) scale. Plants from the several nurseries in and near the town are specially inspected immediately prior to despatch and all but the most tender ones are fumigated under supervision. The number of nursery consignments specially inspected during the year was 509 and the number fumigated was 415.

16. Red scale is the most common insect found on the plants from private gardens, as might be expected from the findings in nursery inspection. It was detected on citrus, rose, fig, and various other plants. Pernicious scale was found once only and then bad on

sixty fruit trees destined for Benoni, but of course condemned. The common mango, pineapple, araucaria, soft and greedy scales were found once or more.

17. *Importation of Beeswax.*—The imports of yellow beeswax were very much lower than in the previous year. The precaution to heat any yellow wax for half an hour to 212°F. is still exercised if the consignor does not declare under oath that it has already been heated to this extent. The imports, according to the inspector's returns, were:—

Inspection Centre.	Yellow Wax.	Cera Alba.	Foundation Comb.
	lbs.	lbs.	lbs.
Cape Town	265 (2)	338 (6)	25 (1)
Durban	3,245 (4)	333 (6)	650 (4)
Port Elizabeth	112 (1)	504 (5)	100 (2)
East London	10 (1)	222 (5)	312 (3)
Johannesburg	3,103 (6)	14 (1)	1,174 (4)
Total	6,735 (14)	1,411 (23)	2,261 (14)

The quantity of yellow wax is only about one-twentieth of what came in during the previous year, while the quantity of white wax was about double and of foundation comb about three times that of the other year. No bees were admitted.

18. *Locusts.*—Not a single swarm of voetganger locusts was reported to the Division from anywhere in the Union during the entire year. The country enjoyed this freedom from the locust pest owing, it seems reasonable to assume, to the high degree of success in locust destruction achieved a few years ago. But it is reasoned that the duration of periods of immunity in the future is likely to prove short compared to the periods between waves of locust trouble that occurred in the times when the pest was not fought vigorously with poisons and by other man-contrived means of destruction. Under the old conditions, when the pest declined naturally through the influence of birds, disease, and parasites and predaceous enemies of many kinds, it may be supposed that various of the subjugating agencies lingered on and tended more effectively to overcome uprisings of the insect for years afterwards than will happen under the new conditions. Gradually the Division has accumulated knowledge forcing it to the conclusion that outbreaks of the Brown Locust in South Africa arise by a rapid breeding up and gathering together of scattered individuals. For generations at a stretch the insect apparently lives the relatively solitary life of a grasshopper. It has been observed over and over again that small swarms tend to appear spontaneously in semi-arid parts of the country in the season following the breaking up of a severe drought. Consequently the Division has expected rather serious outbreaks of voetgangers in the 1920-1921 season in the Karroo following the exceptionally dry year of 1919. At the time of writing this report these expectations are being fulfilled.

CHAS. P. LOUNSBURY.
Chief, Division of Entomology

REPORT No. VI.

DIVISION OF BOTANY AND PLANT PATHOLOGY.

Introduction.—Since my last report was written, I am pleased to be able to record several important changes which have taken place, and which have very materially assisted in the more efficient working of the Division.

The appointment of Mr. B. W. Parkes, as head of the clerical staff, has done much to relieve the technical staff of a good deal of unnecessary clerical work, and generally improve the administration in the Division.

The erection of the phyto-pathological greenhouses was completed by the end of December, and these now afford the necessary facilities for studying the many diseases which could not be tackled before.

A mycologist—Mr. V. A. Putterill, M.A., has been stationed in the Western Province of the Cape with headquarters at Cape Town, where a temporary mycological laboratory has been opened. It is hoped that the Government will lose no time in building for this officer a permanent laboratory with the necessary greenhouse equipment, where he will be enabled to carry out as efficiently as possible, the investigation work expected of him.

Provision has been made on the current Estimates of Expenditure for the appointment of a physiologist who will undertake some of the problems of plant nutrition and physiological diseases.

Steady progress has been made in the eradication of citrus canker, and I wish to place on record the valuable services which have been rendered to the country in the campaign against this disease by Mr. George Hobson, the Chief Inspector, who has carried out his duties—often of a most unpleasant nature—unflinchingly and in a most tactful and efficient manner.

I regret to report that no improvement has been effected towards providing the Division with the much-needed herbarium, laboratory, and storage accommodation. Our collections increase day by day, the staff is also increasing, and matters are getting worse and worse. Under these circumstances it is impossible to do justice to the work entrusted to us and the State is not getting full value for its money. Further there is a grave risk of loss, damage, and fire to the valuable collections and apparatus under existing conditions.

Through the campaign which has been waged against citrus canker and other diseases of citrus, the Division has been brought into close contact with citrus growers throughout the Union, and one can not help feeling that one of the most important requirements for the permanent establishment of the industry is the urgent need for a citrus research station, where the many problems affecting the whole industry can be scientifically investigated on the spot. Such a station, to be of real value to the country, should be established while the industry is still in its infancy.

The activities of the Division now cover such a wide field, that much benefit would accrue to the farming population in general if an itinerant officer were attached to its staff whose business it would be to travel throughout the country and bring to the notice of farmers and fruit growers the work which was being done, and at the same time bring to the notice of the Division the requirements of the farming population.

Correspondence.—Letters and Telegrams received, 7,460; despatches, 6,185.

Staff.—The following changes, etc., took place in the staff: Mr. B. W. Parkes was transferred from Head Office as Chief Clerk to the Division. Mr. V. A. Putterill was transferred to Cape Town on the 31st January as Mycologist for the Western Province, owing to the need for such an official to be stationed there in connection with the treatment of fungus diseases in the orchards, the examination of fruits for export, etc. Miss M. R. H. Thomson was appointed as Mycologist on 27th January, to fill the post rendered vacant by Miss King's resignation. Miss A. G. Corbishley was appointed Botanist at Kew, London, on the 1st October, 1919, to assist in the work arising from the Botanical Survey of the Union. Miss H. Forbes was appointed as Lay Junior Herbarium Assistant in the Natal Herbarium, Durban, on the 1st July, 1919, to assist in the routine work of the Herbarium.

I.—Botanical.

(*a*) *Plants Poisonous to Stock.*—Some 200 plants suspected of being poisonous to stock were submitted for identification and report. Wherever it was possible, feeding tests were carried out by the Division of Veterinary Research in co-operation with this Division.

In Natal the Division of Veterinary Reserch has shown, by definite feeding tests, that the cause of bovine staggers is due to the plant *Matricaria nigellifolia*.

I continued to assist the Director of Veterinary Research in his elucidation of the disease known as "Gouwziekte" in sheep and from the experiments and feeding tests conducted during the past season, it would seem highly probable that the plant *Pachystigma pygmaea* is the causal agent.

(*b*) *Fibre Plants.*—Fibre plants have continued to attract considerable attention and numerous enquiries from the general public during the year. Two companies are endeavouring to establish an industry with *Hibiscus cannabinus* in the Union, while a third company has started to exploit the possibilities of this fibre in Rhodesia.

No promising new fibres were brought to light during the year, but a fibre obtained from *Kniphofia aloides*, which is common in the Eastern Province of the Cape, and which had attracted a good deal of attention locally, on being submitted to the Imperial Institute gave little promise of being of much commercial value.

(*c*) *Oil Plants.*—A sample of *Pappea capensis* seed was submitted to the Imperial Institute for report as to their value as a source of oil, and was reported upon favourably in that it could be used for soap making or as a lubricant.

(*d*) *Noxious Weeds.*—Two dangerous weeds have been dealt with during the year—the Canada Thistle (*Cnicus arvensis*) and *Carduus pycnocephalus*. The former was reported from the Wakkerstroom District in the Transvaal, and the latter from Natal.

Other noxious weeds reported from Natal were the Upright Star-bur (*Acanthospermum hispidum*) and the Prostrate Star-bur (*Acanthospermum xanthoides*).

Another weed which appears to be spreading at the present time in grain lands, gardens, and wayside places in Natal and the Transvaal, is the Galinsoga Weed (*Galinsoga parviflora*), while in the Cape the Water Hyacinth (*Eichornia speciosa*) and the Stinkwort (*Inula graveolens*) caused considerable trouble.

Colour illustrated pamphlets were prepared by Miss Landsdell of the following weeds:

The Upright Star-bur	*Acanthospermum hispidum*
The Galinsoga Weed	*Galinsoga parviflora.*
The Sow Thistle	*Sonchus oleraceus.*
Blue Stinkblaar	*Datura Tatula.*

II.—National Herbarium.

Dr. E. Percy Phillips, the officer in charge of the National Herbarium, in submitting his annual report writes as follows:—

> "I must again refer to the lack of suitable accommodation, as was done in my last report. The original Government herbarium I estimated at 8,000 mounted sheets; last year 5,724 sheets were mounted, and this year the number is 9,727—a total of 15,451 for the two years. As you will see, the number of sheets now is almost doubled. If one includes the herbaria acquired from Madame Dieterlen and the late Mr. H. G. Flanagan, which approximately contain about 6,000 mounted specimens, you will realise to what extent the collection has expanded, but with no corresponding expansion of accommodation.
>
> "It has been impossible to file the mounted sheets in the Cabinets, and they have been stacked on top of the cabinets up to the ceiling. In this connection there is one point which should not be overlooked. It is not necessary to use a separate mounting sheet for each specimen, but the specimens of 2 or 3 collectors may be placed on the same sheet. This is of course impossible to do at present, owing to the fact that the mounted sheets are not accessible. As paper to-day is so expensive this is an unnecessary but unavoidable expense.
>
> "We received two valuable acquisitions during the year. Madame Dieterlen presented her Basutoland collection to the Government, and the late Mr. H. G. Flanagan bequeathed us his whole herbarium and botanical books. The cabinets containing these collections were placed in the herbarium and have practically taken up all the available floor space.
>
> "At present there is no working room in the herbarium for me, and work which I have on hand in conjunction with the Forest Department on the naming and distribution of important timber trees is in abeyance.

I.	Specimens donated to or purchased by the Herbarium (excluding the Dieterlen and Flanagan herbaria)	7,523
II.	Number of sheets mounted	9,727
III.	Duplicate specimens roughly mounted	6,056
IV.	Determinations	3,273
V.	Donations to other herbaria	1,521
VI.	Herbarium sheets loaned to other herbaria (Kew, British Museum, Bolus, Schönland)	1,452
VII.	Herbarium sheets borrowed from other herbaria for examination include the genera *Bauhinia, Elephantorrhiza, Tulbaghia, Entada, Geigeria, Faurea* and *Anagallis.*"	

This report speaks for itself, and I can only add that every time visitors are shown into the present Herbarium, one can not help feeling positively ashamed of the conditions under which the staff is compelled to work and the valuable collections of the nation are housed.

I sincerely hope that the existing state of affairs will be remedied at the earliest possible moment.

III.—BOTANICAL MUSEUM.

Some 421 specimens were added to the Museum, bringing the total number of specimens up to 934. These are displayed as well as circumstances will permit, but more room space is urgently required. The more important specimens of economic value which have been added are:—

Gum from *Combretum erythrophyllum* with leather treated with the same and prepared by the Silverton Tannery.

Oil from *Pappea capensis* prepared by the Imperial Institute.

Berry Wax from *Myrica cordifolia.*

Bush Teas from *Catha edulis*, *Athrixia phylicoides*, and *Aspalathus corymbosa.*

A valuable collection of seeds and pods from Northern Rhodesia was also presented by Capt. Shortridge.

IV.—LIBRARY.

The most important acquisition to the Library was the valuable collection of botanical works bequeathed by the late Mr. H. G. Flanagan.

V.—BOTANICAL SURVEY.

Considerable progress has been made with the Botanical Survey of the Union.

In the South-Western area Dr. Marloth visited Robertson, with the object of obtaining more definite information on the boundaries and features of the Robertson Karroo. He also visited the Bokkeveld Karroo and the western end of the Bontebergen Range near Karroopoort, where some important observations relating to Krimpziekte were made. Several minor excursions for the purpose of making special observations of botanical interest were also carried out.

In the South-Eastern area Dr. Schonland was particularly active and established several important facts regarding the phytogeographical boundary between the South-Western and South-Eastern areas.

Dr. Schonland also visited the districts of Bedford, Somerset East, Jansenville, Willowmore, Uniondale, Knysna, Humansdorp and Uitenhage for the purpose of making observations on the forests in these latter areas, and in particular to study the problem of soil erosion in the Karroo.

In reporting on his tour, which was made at a time of unprecedented drought, Dr. Schonland emphasized the great value of many of the indigenous plants such as the Noors (*Euphorbia coerulescens*) and others as stock food, and has pointed out that, but for these plants, no stock could have survived the drought in these areas, except on farms where lucerne or other food had been specially grown.

It is hoped that as a result of Dr. Schonland's observations on soil erosion and denudation, definite experiments will be carried out under his supervision at the Grootfontein School of Agriculture, Middelburg, where excellent facilities exist for work of this nature.

The Botanical Survey also published as Memoir No. 1 a valuable paper by Dr. Schonland on the "Phanerogamic Flora of the Divisions of Uitenhage and Port Elizabeth".

In the Eastern area Professor Bews has directed his attention more particularly to the vegetation of the Natal Coast Belt, and as a result of this and previous work which he had already undertaken, he has prepared a paper, the fourth of a series which he began in 1912, and which will be published like its predecessors in the Annals of the Natal Museum.

In the Central area I made a tour through Griqualand West to the eastern edge of the Kalahari and was able to define the boundaries of this region more clearly than it has been possible to do in the past.

I also had occasion to visit the South-West Protectorate and through the courtesy of His Honour The Administrator, Sir Howard Gorges, K.C.M.G., M.V.C., and the Director of Railways, Lt.-Col. R. C. Wallace, I was enabled to visit the chief vegetation regions of the Protectorate and form a general impression of the conditions prevailing there.

VI.—MYCOLOGY.

Miss A. M. Bottomley, B.A., had charge of the cryptogamic section of the National Herbarium, when some 3,045 specimens were added.

A large number of foreign specimens have been added, including C. F. Baker's "Fungi Malayana," 6th Century, Fasc. 52-55 of Sydow's Uredineen, a collection of

Porto Rican fungi from F. L. Stevens, fungi from Dummer, Uganda, from Junod, Portuguese East Africa, and from various other sources.

Dr. Ethel Doidge has completed a study of the *Microthyriaceae* and has written a paper on the subject which has been sent for publication.

VII.—PATHOLOGY.

The routine work in connection with various plant diseases submitted has again been heavy and involved a good deal of time on the part of the technical staff. In particular a large amount of material, including tobacco and cotton diseases, was forwarded for examination, and as the diseases of these crops have not been studied from a South African point of view, it is essential that an officer be specially detailed for this work. This, I am glad to say, the Minister has already approved of.

Special attention has been directed to the conditions under which the export of citrus fruits is carried out, to citrus canker, to bacterial diseases of tomato, cow pea, pineapple, tobacco, and lemon. Other diseases which have been studied include Paspalum ergot, flag smut of wheat, dry rot of eucalyptus, apple canker, die-back of apricot, and spraying experiments against walnut bacteriosis.

A Mycological Laboratory was opened in Cape Town in January last under the charge of Mr. Putterill, M.A. In addition to the research work being carried out there Mr. Putterill has been engaged in potato and plant inspection at the docks as also examination of export fruits. Prior to his transference to Cape Town, Mr. Putterill was engaged on investigations, dealing with flag smut in wheat, apple canker, die-back of apricot trees due to *Schizophyllum commune,* and field spraying experiments against walunt bacteriosis. Papers dealing with these diseases have been prepared and will shortly be published.

Natal Herbarium.—Dr. van der Bijl has continued his studies relating to diseases of sugar, and published an article entitled "Observations on a Fungus—*Cephalosporium Sacchari*—which causes a red-rot in Sugar Cane stems." He also published a preliminary report on his investigations dealing with sugar deterioration in the mill, as also an article on "A Leaf Spot of the Pea-nut or Monkey Nut plant." He continued his studies of the Polyporaceae, and it is hoped to publish same as a monograph at an early date.

The correspondence dealt with by the mycologist-in-charge amounted to 609 letters received and 456 despatched.

VIII.—PUBLICATIONS.

The following articles were prepared by officers of the Division and published during the period under review:—

I. By I. B. Pole Evans, M.A., D.Sc., F.L.S.: Report on Cold Storage Conditions for Export Fruit at Cape Town, Dept. of Agric. Bull. 2 of 1920.

By I. B. Pole Evans, M.A., D.Sc., F.L.S., and K. A. Lansdell: (1) The Jointed Cactus—Dept. of Agric. Bull. Local Series, No. 75. (2) The Imbricate Cactus—Dept. of Agric. Bull. Local Series, No. 76. (3) The Cockle-bur—Dept. of Agric. Bull. Local Series, No. 74. (4) The Khaki Weed—Dept. of Agric. Bull. Local Series, No. 73.

II. By Ethel M. Doidge, M.A. D.Sc., F.L.S.: (1) An interesting group of Leaf Fungi—South African Journal of Natural History, 1.164-171, Sept., 1919. (2) The Role of Bacteria in Plant Diseases—Presidential Address, Section C. S2 A3—South African Journal of Science 16, 65-92, Sept., 1919. (3) South African Perisporiaceae—Trans. Roy. Soc. of South Africa 8, 107-143, 1920. Completed 1918: (iii) Notes on Four Species of Meliola hitherto unrecorded from South Africa. (iv) New species from the coast districts. (v) Notes on an interesting collection from Natal. (4) Mycological Notes I.—Trans. Roy. Soc., South Africa, 8, 117-119, 1920 (completed 1918). (5) South African Microthyriaceae—Trans. Roy. Soc., South Africa, 8 (in Press). (6) Meliolaster, a new genus of the Microthyriaceae—Trans. Roy. Soc., South Africa, viii, 121-123, 1920 (completed 1918). (7) Walnut Bacteriosis—South African Journal of Science, 15, 407-412, 1919 (read 1918). (8) The Bacterial Blight of Beans—*Bacterium Phaseoli*—Erw. Sm. South African Journal of Science, 15, 503-505, 1919 (read 1918). (9) South African Ascomycetes in the National Herbarium—Part I (not yet published). (10) Diseases of Stone Fruit Trees:. (1) Leaf Curl—South African Fruit Grower, VI., p. 211, Aug., 1919. (2) Peach Freckle—South African Fruit Grower, VI., No. 10, Oct., 1919. (3) Brown Rot—South African Fruit Grower, VI., No. 12, Dec. 1919.

III. Dr. E. P. Phillips: (1) A Note on the Pollination of *Cyanella capensis*—South African Journal of Science, XV., 500. (2) Some Notes on a collecting Trip to French Hoek—South African Journal of Science, XV., 450. (3) A Note on the Flora of the Great Winterhoek Range—South African Journal of Science, XV., 226 (4) *Acmadenia teretifolia*, Phill.—Kew. Bull., 1920, 23. (5) *Leucadendron uniflorum*, Phill.—Kew. Bull., 1920, 26. (6) The genus *Borbonia*, Linn.—South African Journal of Science, XVI., 397. (7) Three Noteworthy Species of Plants from South Africa—South African Journal of Science, XVI., 429. (8) A Note on the genus *Faurea*, Harv.—South African Journal of Science, XVI., 232 (with Mr. J. J. Kotze). (9) A preliminary Report of the Veld-Burning Experiments at Groenkloof, Pretoria—South African Journal of Science, XVI., 285. (10) A brief Analysis of the work of Carl Thunberg on the *Proteaceae*—South African Journal of Science, XVI., 380. (11) The importance of a property equipped State Herbarium to an agricultural country—South African Journal of Natural History, 2, 1.

IV. Miss I. C. Verdoorn: (1) The genus *Fagara*—Journ. Bot., Aug., 1919. (2) The Order Primulines as represented in the Transvaal—South African Journal of Science, XVI., 365.

V. By P. A. van der Bijl, M.A., D.Sc., F.L.S.: (1) Observations on a Fungus—*Cephalosporium Sacchari*—which causes a red-rot in Sugar Cane stems. (2) Preliminary Studies on some Fungi and Bacteria responsible for the deterioration of South African sugars. (3) Botany in relation in Agriculture and other Applied Sciences (Pres. Address to the Natal Society for the Advancement of Science and Arts). (4) A list of Host-plants of some of the *Loranthaceae* occurring around Durban, Natal—Read at Meeting of S.A.A.A.S. (5) The systematic position of the Fungus causing Root Disease in Cane in Natal and Zululand—Read at Meeting of $S^2 A^3$. (6) A Ripe Rot of Paw-Paws—South African Fruit Grower. (7) Chats on Dry-Rot of Maize and the variegation of maize kernels—Lecture delivered to Maize Conference, Johannesburg. (8) Hollowness of Cane-stems—Circular Natal Sugar Association, Aug., 1919. (9) Observations on the Flowers of the Uba—Circular Natal Sugar Association, Aug., 1919. (10) Root-fungus of Cane—Circular Natal Sugar Association, Aug., 1919. (11) " Algemene Plant- en Dierkunde "—Article for " Populair Wetenskaplike Leesboek." (12) " Plant-Parasiete "—Article for " Jaarboek, Afrikaanse Wetenskaplike Vereeniging."

VI. By Averil Bottomley, B.A.: (1) Memorandum on " Fungous Diseases of Wheat in South Africa "—Report of the Departmental Committee on Wheat Growing, appointed by the Minister of Agriculture, to enquire into the conditions of wheat growing in the Union of South Africa, 1919.

VII. By V. A. Putterill, M.A.: (1) A New Apple Tree Canker—South African Journal of Science, Vol. XVI., No. 3, Oct.-Dec., 1919. (2) Flag Smut of Wheat—Agricultural Journal, June, 1920.

I. B. POLE EVANS,
Chief, Division of Botany and Plant Pathology.

REPORT No. VII.

DIVISION OF DAIRYING.

Staff Matters.—During the period under review several changes in the staff have taken place. Messrs. Gow and Dewey, I am glad to say, returned safely from active service overseas, but unfortunately the latter officer resigned his position on the 31st December, 1919, in order to take up a more lucrative business appointment. During the period Mr. Dewey was stationed in Natal he did excellent work, and was highly spoken of by all the farming community, and I was very sorry to lose such an experienced officer's services. Mr. F. B. Sutton was appointed in Inspector Dewey's place, but his services were loaned to the Glen College, pending the permanent appointment of a Lecturer in Dairying there, and it is anticipated that he will shortly be taking up duty in this Division. Mr. F. Wilkinson was appointed from the 1st April, 1919, as Official Grader and Inspector under the Dairy Industry and Factories Acts, and is at present stationed at Queenstown, in the Cape Province. Dairy Inspector J. P. Gow was, from the same date, promoted to a similar position. In addition to the resignation of Inspector Dewey, Inspector T. Hamilton resigned on the 29th February, 1920, to take up the appointment of Dairy Expert with the British South African Chartered Company, in Southern Rhodesia, the salary and prospects being considerably better than was the case here. Up to the present this vacancy has not been filled, as I consider it highly desirable, in view of the rapid development of Creameries in the Union, to appoint an officer who is a specialist in Creamery management, and who himself has been in charge of up-to-date Creameries; so far I have not been able to obtain the right class of man I require, but hope to do so in the near future. Mr. J. Allison, Lecturer in Dairying at the Elsenburg School of Agriculture, was appointed on the staff of this Division on the 1st July, 1919, in place of Inspector Oosterlaak, who was promoted to Inspector Gow's place, and is at present stationed in the Free State Province.

BUTTER AND CHEESE PRODUCED IN THE UNION

Total Output of	1918. Lb.	1919. Lb.
Butter by Creameries	13,939,558	9,335,219
Butter sold on Markets	2,781,490	2,453,240
Butter sold to Merchants	2,500,000	2,000,000
Totals	19,221,048	13,788,459
Cheese: Factories and Cheeseries	6,816,314	3,756,145

From the above figures it will be seen that there was a very serious reduction in the 1919 output of butter, viz., 5,432,589 lb., as compared with 1918, and in cheese a reduction of 3,060,169 lb. This decrease in butter, in a great measure, is due to the aftermath of influenza and the caterpillar plague, followed by a severe drought in all parts of the Union during the months of November and December, when in normal seasons usually large quantities of butter are produced. This, to a certain extent, applies to the output of cheese, but there is another factor which mitigated against greater production of this commodity, viz.: the terms offered by the Imperial Government for the second contract not offering inducement to encourage export. The first contract was for 1s. 1d. per lb. f.o.b., and payment of 30 days' storage, whereas the second contract only provided for 10¾d. per lb. f.o.b., and two months' storage at the sellers' expense. This, combined with the high price demanded by the farmers for their milk, made it almost impossible to produce cheese for export, except at a loss, consequently most factories curtailed their purchase of milk to the extent of meeting local requirements only, the balance of the milk which would have been converted into cheese was, in the majority of instances, separated and the resulting cream manufactured into butter. It was also considered by quite a number of cheese producers that the manufacturing of butter, and the feeding of the skim milk to pigs, was a more paying proposition than making cheese at 10¾d. per lb.

IMPORTS FOR 1918 AND 1919.

	1918. Lb.	1919. Lb.
Butter	67,275	356,035
Cheese	197,621	20,334
Margarine	19,702	102,613
Ghee	540,858	336,224

In addition to the above, the following were imported but *re-exported* during 1919: Butter and Butter Substitutes, 29,503 lb.; Cheese, 21,330 lb.

The most notable feature in the above figures is the somewhat alarming increase in the importation of margarine, viz.: 82,911 lb. in excess of that imported during the previous year. This increase is largely due to the scarcity of butter during certain months in the period under review, and also to the prohibitive price being asked for butter at that time. The importation of Ghee shows a decrease, which to some extent is explained by the fact that a certain quantity of this commodity was manufactured locally.

Export of Dairy Products from the Union: 1919.—Butter, 493,914 lbs.; Cheese, 1,525,638 lb.

With regard to the export of cheese from the Union, figures are furnished by the Customs Statistical Department, but no indication is given as to its destination, and as no cheese manufactured in 1919 was graded for export, the bulk of the quantities sent forward no doubt belonged to that purchased by the Imperial Government in 1918, and not shipped until about February or March, 1919. Of course certain quantities of the above were sent to places outside the Union, such as the Belgian Congo, Delagoa Bay, Rhodesia, etc.

General.—The dairy industry of the Union is in a somewhat peculiar position at the present time, owing to the excessively high prices being paid for milk and cream for cheese and butter production, and with a fall in prices for the manufactured article, which is bound to come sooner or later, will I am afraid lead to heavy financial losses. There is moreover still a tendency to erect Creameries in districts which are already fully provided for, and a still greater tendency to erect what might be termed "one horse shows" which, in many instances, are badly equipped, and worse managed. Of course, under the Dairy Industry Act of 1918, such concerns could be refused registration, but it is extremely difficult to know where to draw the line, and I consider it will be necessary in the near future to lay down definitely by Proclamation what a registered Creamery must consist of, and all buildings erected after the issue of such Proclamation would have to comply with the conditions laid down therein.

In many directions, however, improvements are noticeable, farmers are paying more attention to winter feeding than was formerly the case, and increased and better shedding accommodation is being provided, as well as steady improvement in the quality of the dairy stock generally. The progress of dairying in the Transvaal Province is perhaps not quite so rapid when compared with the other Provinces, and there is room for considerable development in regard to winter dairying in the Northern Transvaal, which, in my opinion, is perhaps one of the best winter dairying areas in the Union.

The keeping of milk records of pedigree stock continues to make rapid strides, and the benefit to be derived from such records is now being fully realised by those who have taken advantage of the opportunity afforded them thereby. Although the present taking of records only applies, with one or two exceptions, to Friesland breeders, it is hoped before very long all societies for pure bred stock will amalgamate and the expenses at present incurred will in consequence be considerably reduced.

ED. O. CHALLIS,
Superintendent of Dairying.

REPORT No. VIII.

AGRICULTURAL RESEARCH CHEMIST.

The difficulties in the way of organised systematic investigation, consequent on lack of chemicals and appliances, have not yet disappeared, and in addition to these equipment troubles, work is hindered by lack of suitable and sufficient accommodation.

The reference library is being augmented and card catalogues thereof have been prepared.

FERTILISERS.

The analyses of Cape Cross Phosphate, referred to in my last annual report, have been continued, and the results of the entire series have been published in the *South African Journal of Industries.*

A visit was paid to Matjesfontein in connection with the occurrence of phosphates, and several samples of the phosphatic rock were procured and analysed. The rock gave promise of being a useful raw material for superphosphate manufacture, if obtainable in sufficient abundance.

Phosphatic nodules were also subsequently received from Britstown, and some minerals found near Rossing station in the South-West Protectorate have likewise been found to contain phosphates.

Calcareous formations from the neighbourhood of Saldanha Bay and of Uitenhage have been examined, but no commercially appreciable quantities of phosphate were found in them. A calcareous soil from Plettenberg Bay, containing 70 per cent. of agricultural lime, and some impure gypsum from the farm Zwart Lintjes River may also be mentioned amongst the articles of this general character examined.

References have frequently been made to the fertilising value of seaweed ash. Some of this ash, prepared at Robben Island a couple of years ago not having resulted very satisfactorily, further samples were prepared at Hondeklip Bay according to a method suggested by me. They proved to contain much more potash than the samples from Robben Island.

SOILS.

The following summarises the soil work carried on in the laboratory during the period under report:—

Cape Division.—The question of the agricultural value of vlei lands near Milnerton, belonging to the Government, arose in connection with offers for the purchase of those lands, and this entailed visits to the locality in order to study the *brak* conditions on the spot and collect samples.

Samples of soil and water were also collected on the Cape Flats at Sterrenberg in order to study the nature of the occurrence of brak salts there and the possibility of improving the conditions. At the close of the period under report the matter was still being investigated.

Of the sandier soils of the Cape Peninsula samples were taken for analysis in the neighbourhood of Tokai and at Retreat. An investigation was also made of a series of more or less sandy soils from the farm De Grendel in the Tygerberg area. Near Durbanville the soil from the plots reserved for returned soldiers was examined. The ground was in an uncultivated condition, covered by bushes and rather sandy in appearance.

On the western side of the peninsula samples were collected and analysed from a vineyard at Oude Kraal, where the grapes had become atrophied or diseased after attaining a certain size, and the trouble was thought to be due to soil deficiencies. At Hout Bay and Kommetje, further south on the same side of the peninsula, other sets of soils were collected and examined.

Paarl and Worcester Divisions.—An examination was made of the soil of a pear orchard in the Paarl Division where a serious die-back of the tree-branches had occurred, and of a similar orchard near Worcester where the pear trees were also showing signs of languishing.

Tulbagh Division.—It had been my desire, in connection with the visit of the Departmental Wheat-growing Committee to Tulbagh a few years ago, to investigate the various classes of soil used for cereal cultivation in that area. Circumstances prevented my personally touring the Division for that purpose, but Mr. E. H. Nellmapius, B.Sc., very kindly undertook the collection of a set of typical soils, and forwarded them to the laboratory, where they have been duly analysed.

Analyses were also made of two types of soil from the farm Kleinberg on the western side of the Tulbagh valley, where the soil is shallow and gravelly.

Malmesbury Division.—On the farm Geelbeksfontein my attention was directed to the possibility of the surface soil being chemically improved by deep ploughing; samples of both surface and subsoil were therefore collected for analysis with confirmatory results.

Oudtshoorn Division.—An examination of the soil from Roode Heuvel in the Oudtshoorn Division was made in connection with the indigenous growth of licorice, for which the soil seemed suited.

Mossel Bay Division.—In order to ascertain the nature of the soil from the sandy belt along the Mossel Bay and George coast line, a typical poor soil from the farm Zandfontein near Cooper Siding was examined.

George Division.—Here a more detailed investigation was undertaken, with a view to getting the more important belts of soil which characterise these coastal Divisions clearly charted.

Knysna Division.—Analyses were made of the poor sourveld silt loams near Portland, and also of soils from the Harkerville Plantation, the latter for the purpose of throwing light, if possible, on a malady amongst the young pines.

Uitenhage Division.—Different types of alluvial valley and hill soils were collected on the farm Cadles, in order to gauge the suitability of the locality for considerable extension of citrus culture.

Prieska Division.—At Draghoender an occurrence of "leafdrop" in the peach trees led to an examination of the soil of the locality.

Orange Free State.—The only type of soil from this province examined was one of a sandy character from the Harrismith district, where wheat culture—for which the soil did not appear to be physically suited—was being attempted.

Transvaal. Samples of virgin grass-veld soil from the dry lands at Groenkloof, near Pretoria, were examined in connection with the problems arising from the practice of veld-burning and its effects on the incidence of *gallamziekte* in cattle. An examination was also made of soils from the Dolomite formation lying under the Drakensbergen in the Lydenburg district, an area where the greedy gnawing of bones by stock, which had for years been regarded as indicating phosphate-deficiency in soil and fodder, is a characteristic feature.

Wheat-growing enquiry.—A large number of soils, not enumerated above or previously, have been analysed in connection with the enquiry of the Departmental Committee on wheat growing. They included samples from the Divisions of Paarl, Tulbagh, Malmesbury, Piquetberg, Caledon, Bredasdorp, Riversdale, George, Humansdorp, Uitenhage, Namaqualand, Calvinia, Oudtshoorn and Groot Marico.

At the request of the Secretary for Agriculture, I prepared a memorandum for the United States Consul describing agricultural soil conditions in the Union of South Africa.

Preliminary steps have been taken to study the action of soil organisms in a locality where marked beneficial results have been attributed to inoculation of the soil.

FOOD MATERIALS.

Condensed Milk.—Analysis was made of a full cream milk of South African origin. It resembled the sweetened whole milk usually imported, possibly enriched by the addition of cream. Improvements in the conditions of manufacture appeared possible.

Wine, Spirits and Vinegar Act.—Two points arose for consideration in this connection: one was the prevention of addition of sugar to wine. The matter cannot be dealt with satisfactorily except through the Excise Office, and the powers at present vested in the Government are not wide enough to allow of effectual regulations either under the Excise laws or under the Wine, Spirits and Vinegar Act: such was the finding of a conference on the subject between the Superintendent of Excise, the Cape Government Analyst and myself.

A small quantity of honey vinegar, produced at an apiary in the Hopefield Division, was examined. It was understood that large quantities of this material could be manufactured, but the definition of "vinegar" under the Act precludes its sale under that name.

PLANTS AND PLANT PRODUCTS.

Plants of various characters have been examined during the period under report: amongst these were fibrous plants, such as the *palmiet* and the New Zealand hemp. Of plants reported as poisonous to stock mention may be made of a creeper from Constantia. Both chemical and physiological tests failed to confirm the allegation.

Two plants from Saldanha Bay possessing a feeding value were examined: one was a sea-grass which used to be employed by the aborigines of the south-west coast for wrapping their dead in before burying. The other was a cyperaceous plant said to be specially valuable as a pig fattener.

Of plants useful in tanning, the Elands-boontje has been under further examination, and the results of the general study of the plant in this connection have been published.

Some consideration has been given to the possibility of utilising the exhausted licorice root which forms a waste product in the manufacture of licorice confectionery. The quantity of the dried roots available is said to be some hundreds of tons annually.

General.

For the purpose of a report on the salt industry of the Union very large numbers of samples of salt, bittern and brine have been under investigation for many months past: in some of these the possible presence of potash has been investigated, and the occurrence of a very pure potash saltpetre has also been reported from the Ceres Division, but the occurrence has not been confirmed.

Amongst the subjects of a more specialised character that have been recently, or are still, under investigation may be mentioned the useful applications of wool waste and the problem of facilitating the extraction of rennet. The advice of the Division has also been sought in such matters not strictly speaking within its scope as an unexplained mortality amongst the Angora goats in the Graaff-Reinet Division, and a trouble caused by excessive growths of algae in water reservoirs at Moorreesburg.

Under the Dairy Industry Act, 3,907 test bottles have been officially examined, upon payment of fees amounting to £95.

Other duties performed have included service on a Committee of the Education Department on University Equipment, and the functions of judge of fertilisers at the Rosebank Agricultural Show.

Technical reports have been prepared during the year on unit values of bone meal and phosphates, Citric acid solubility in fertilisers, the agricultural soils of the Union, prickly pear destruction by arsenious chloride, *Aloe dichotoma* as a paper making material, calcium cyanamide, South Australian vineyard soils, and Utilisation of the prickly pear.

Printed papers have been issued on South African mylabrids as a source of cantharidin, The Elands-boontje, Oils from *Heeria paniculosa*, Fertiliser production and natural fertilisers in the Union, and The use of hard or saline waters for sheep dipping.

CHAS. F. JURITZ,
Agricultural Research Chemist.

REPORT No. IX.

DIVISION OF CHEMISTRY.

Staff.—The professional staff was increased by the appointment of D. J. R. van Wijk, M.Sc., and E. F. English, M.Sc., as Assistant Chemists.

Analytical Work.—The samples received for analysis or examination were: Soils and subsoils, 300; fertilisers, 80; plant and plant products, 21; phosphatic rocks, 5; nitrate bearing rocks, 15; dairy products, 18; miscellaneous, 23; total, 462.

Soils.—The soils examined were mostly from the Transvaal and represented the usual types. One set of samples calls for comment. They were taken from a lucerne land and contained an abnormally low percentage of nitrogen in spite of the fact that the soil had been heavily manured with kraal manure. Root nodules were absent and the lack of nitrogen was limiting the growth of the crop. Since lucerne, like other legumes, should, under normal conditions, be able to obtain all the nitrogen compounds necessary for growth from the atmosphere provided the symbiotic bacteria are present, the limitation of the crop by lack of nitrogen is a very unusual and undesirable state of affairs, fortunately of comparative rarity. Inoculation by means of soil from land on which the legume develops root nodules, should be practised in such cases.

Fertilisers.—The fertiliser samples received from farmers show that vendors in most cases comply with their guarantees. A noticeable feature, however, is the number of cases in which the deficiency in a water soluble phosphoric oxide was reported and an even greater number in which the potash was deficient. The former deficiency is due to the admixture with superphosphate and dissolved bone, of basic substances such as "karroo ash" and also of bone meal, reversion of the water-soluble phosphoric oxide being caused in both cases. This reversion does not prejudice the purchaser to any great extent as the phosphoric oxide remains in a highly available form. The deficiency in potash may be ascribed to two causes, faulty sampling and the difficulty merchants have in obtaining supplies of raw materials of anything like even composition.

Nitrate-bearing Rocks.—Twelve samples of nitrate-bearing rocks from near Prieska were analysed at the request of the Director of the Geological Survey. The results were published in Geological Survey Memoir No. 14.

Phosphate Rocks.—All the samples examined contained phosphoric oxide in too small a quantity to be of any value.

Dairy Glassware.—As prescribed by Government Notice No. 600 of 1919, all glassware used in testing milk and cream must be examined for accuracy of the graduations and, if found correct, must be officially marked. The following quantities were examined and marked by this Division:—

	Tested for Accuracy.	Found Correct and Marked.
Babcock test bottles	3,520	3,360
Pipettes	705	675
Gerber tubes	29	11

The proportion of Babcock bottles and of pipettes rejected as inaccurate was about 4 per cent. while the rejections of Gerber tubes was 62 per cent. The Gerber tubes were all of one make and belonged to the Dairy Division. Of the Babcock bottles those designed to test up to 40 per cent. and 50 per cent. were the least accurate, the best class of bottle being that made to test up to 30 per cent. only and conforming more or less to the standards of shape, size and marking laid down by the Regulations, a proof of the wisdom of the latter. As the greater part of the glassware forwarded by creameries and merchants for testing were received during June and July, 1919, we were faced with the problem of dealing with the articles in a reasonable time. A rapid and accurate method for the calibration of Babcock test bottles was devised by Mr. B. J. Smit, which greatly facilitated and expedited the work. This method was introduced in August.

Act No. 21 of 1917.—Registration of fertilisers and farm foods which nominally should be effected just before the end of the calendar year, actually proceeds continuously throughout the year. From April to December, 1919, there were 128 registrations of fertilisers and 6 farm foods, while from January to June, 1920, 17 farm foods and 239 fertilisers were registered. Twenty samples of fertilisers were purchased by the Inspector which were all analysed in the Chemical Laboratory of the School of Agriculture, Elsenburg. This inspection is not considered sufficient and the appointment of a whole time inspector attached to this Division is urged. A number of samples, principally of superphosphate and basic slag, were taken by Customs from consignments imported into the Union. The quality was good, usually high grade, and complied with the registrations.

Correspondence.—There has been a large increase in the correspondence handled by the Division. During the period under review, 930 letters were sent out.

Weed Destruction.—In conjunction with the Inspector of Noxious Weeds for the Transvaal, experiments were carried out on destruction by spraying of weeds, particularly the Mexican Marigold (Tagetes minuta). A piece of ground was set apart and fenced by the Pretoria Municipality, and measured plots were sprayed with solutions of sodium arsenite and also with Rademeyer's preparation (used in the destruction of prickly pear). Both the arsenite and Rademeyer's solution killed all annuals in a few days. The vegetative parts of perennials were destroyed, but fresh growth was made in most cases. Examination of the soil and of the grass subsequent to spraying indicated that there was no danger of stock poisoning. The effect on a subsequent crop is to be studied.

Other Experiments.—Experiments on the interaction between fertilisers and soils were continued and an investigation on the active principle of a plant was commenced. All this work suffered greatly owing to the time spent on dairy glassware from June to November, 1919.

Survey of Soils of Hartebeestpoort Irrigation Area.—B. J. Smit, worked in the field from 8th to 30th June, 1920, to complete the mapping of the soils in this area, work which had been commenced in 1914, by the late H. J. Vipond.

Publications.—A bulletin (No. 5 of 1919), entitled "The Composition of Some Feeding Stuffs", by B. de C. Marchand and B. J. Smit, was published in June. Feeding stuffs analysis is discussed and the results of the analyses of a number of South African grasses and some other foods reported. The bulletin is intended as an amplification of "The Composition of Crops and Feeding Stuffs", by H. J. Vipond.

B. DE C. MARCHAND,
Chemist.

REPORT No. X.

TOBACCO AND COTTON DIVISION.

No changes have taken place in the staff during this period.

The Chief of the Division was away from office on vacation leave for six months and on duty Oversea for three months.

The Assistant Chief performed the duties of the Chief during the latter's absence.

The shortage of staff is still a serious drawback to the work of the Division, but we hope to improve this position in the near future, as negotiations are now in progress to secure more men.

During the period under review, there were 5,952 letters and telegrams dealt with at Head Office while 7,495 were dealt with by the District Officers.

Publications.—Owing to the heavy pressure of work and the serious shortage of staff, the officers of the Division have not had time to prepare publications. This is particularly serious in view of the fact that all of the publications of the Division are completely exhausted.

For the same reasons we have been compelled to withdraw the Tobacco and Cotton contribution to the Departmental Exhibit at the Agricultural Shows. This is an injustice both to the public and the Agricultural Department.

Tobacco.—The tobacco crop for the Union will approximate 12,000,000 lb. The price for all grades of tobacco has been good and is such, that tobacco is a profitable crop to grow. The demand of the Oversea market has so increased that it at the present time cannot be met. This is an opportunity which the Union should not fail to grasp; as the future development of the industry must hinge on the permanent establishment of an oversea trade. In spite of our limited crop, the exports greatly exceeded the imports. (Exports, 1,550,047 lb.; imports, 75,924 lb.), for the year ended March 31st.

The three Tobacco Associations at Rustenburg, Paarl and Parys had a very successful year, but they could have handled far more tobacco than they did and at the same time could have maintained good prices. This only illustrates the need for greater production.

The Societies were recently visited by an oversea buyer who was prepared to take considerably more tobacco than the country can spare for export.

Cotton.—There are from 10,000 to 12,000 acres planted to cotton in the Union this season. This is a somewhat larger acreage than was planted the previous season. We anticipate that the crop will approximate 3,000,000 lb. of seed cotton which will be a considerable increase over the yield of the previous year. The development of the industry during the past two or three years has been so rapid that it has been difficult for commercial ginning companies to obtain ginning machinery fast enough to cope with the business. Since my last report, ginning machines have been purchased for the Transkei, Swaziland and one or two more for the Transvaal.

A cotton seed oil mill firm near Durban has entered contracts with certain ginning companies to take all of the cotton seed produced by them, at the world's market price, less what would be charged as ocean freight if shipped. This means the establishment of a new industry which may also lead to other subsidiary industries, and the possibilities are almost limitless.

Last seasons' cotton lint sold at an equivalent average of about 2s. 5d. per lb. free on board.

I do not expect our cotton to remain at anything like the present high price, but as long as it remains above 1s. per pound, it will be a good paying crop.

Cotton growing on the plantation system is receiving serious consideration; there are several large estates that have already commenced operations, and their plans are to continue development till they each get a few thousand acres under cotton. If these companies meet with success in the beginning we may expect to see very big developments during the next five or ten years.

Pure-seed.—The demand for both tobacco and cotton seed has increased to such an extent that it is no longer possible for us to attempt to supply all requests. We are, therefore, reducing the amount supplied to any individual, and so far as possible, only supplying to those who want pure seed, or to beginners.

With the rapid increase in cotton culture, the officers of this Division find it impossible to cope with the work. With such conditions we cannot do justice to it and it is not fair to the officers, as they find it necessary to work Saturday afternoons, Sundays, Public Holidays and late hours at night and even then it has to be rushed through.

British Cotton Growing Association Prizes.—Last year I communicated with the Secretary of the above Association through the Acting Trade Commissioner in London, and submitted a scheme, asking him to contribute money prizes, so as to further stimulate the cotton industry in South Africa. The Association accepted my recommendations and offered two sets of prizes as follows:—

For best 50 acres of cotton	£100	0	0
For 2nd best 50 acres of cotton	50	0	0
For 3rd ,, ,, ...	25	0	0
For best 10 acres or more but less than 50 acres	50	0	0
For 2nd best 10 acres or more, but less than 50 acres	25	0	0
For 3rd ,, ,, ,, ,, ...	12	10	0

I am pleased to report that more than a hundred farmers entered these competitions and although a good number have dropped out, there are about 65 or 70 still competing.

Carrying out the inspection and rating of all these fields has been an extra heavy burden on the officials of this Division, but all of the fields were visited by us and the final rating which we undertook to do will be made as soon as all of the cotton is ginned. Then samples of the lint will be sent to the British Cotton Growing Association to determine the relative quality of the lint produced. This competition has entailed a lot of work and travelling, but the interest aroused should fully justify the awards offered and the labour involved.

Experiment Station Work.—The stations have conducted operations along the following lines:—(1) Seed selection; (2) Variety tests with tobacco and cotton; (3) Methods of curing tobacco; (4) Cultural methods with tobacco and cotton; (5) Hydridizing; (6) Special selection of plants; (7) Seed distribution; (8) Training of students in farm practice; (9) Keeping daily records of temperature, rainfall, etc.

The officers of the Division have been busy visiting farmers to give advice on tobacco and cotton on the farms, lecturing at farmers meetings, and at the Agricultural Schools, judging at Agricultural Shows and acting generally in an advisory capacity to farmers.

Rustenburg Experiment Station. The Manager received and despatched 1,450 letters and telegrams during this period in addition to the regular monthly returns and monthly reports.

The Students' Hostel has been full all the time; these apprentices are, most of them, doing good work and should develop into useful men. Some of them have already accepted billets as Managers for farmers. The work at the Station has so increased that the Manager needs two assistants, a technical field assistant and a clerk in the office to relieve him of a lot of routine work.

There were 310 visitors at the Station during this period. Although the season was not a very good one, the Station was kept in a tidy condition and the crops carefully cultivated and as a result, our tobacco crop is fair and with the high prices will, probably, sell for the highest price so far obtained. All of the cotton varieties, grown on 18 inches of rain, will give yields of more than 1,000 lb. of seed cotton per acre.

The other crops, such as forage and maize, did fairly well.

The young plantation, consisting of about 3,000 trees, is making good growth and now stands, approximately, 4 ft. high.

The revenue produced at the Station last season was the largest yet given.

Elsenburg Tobacco Station.—During this period the Manager received and despatched 1,015 letters and telegrams in addition to forwarding the regular monthly returns and reports.

There were 366 visitors at the Station during this period. Although the season was very dry and the crops developed slowly, the tobacco crop will be fair. The other crops such as forage and green manuring crops, harvested earlier in the season were quite good.

In addition to managing the Station, the Manager visited 282 farmers and gave 34 lectures. The revenue from the Station last year was the largest yet obtained.

The breeding and selection work on Turkish tobacco was continued and the Manager is now able to supply good seed of selections which are proving to be superior to the imported seed, in respect of producing plants with uniformity and number of leaves, and which are equal to the imported article in the production of flavour and aroma. This phase of the work alone will justify the maintenance of the Station.

Piet Retief Station.—The Foreman received and despatched during this period 215 letters and telegrams, in addition to forwarding the usual monthly returns and reports.

There were 152 visitors at the Station during the period under review.

This Station has been without a Manager for more than twelve months. The Foreman has carried on during this time, but no decided progress will be made till a qualified Manager is found and placed in charge. I hope in the near future to improve upon the present arrangement there. We have continued cultivating the leading varieties of tobacco which seem to be most suited to the district and, in spite of the attacks of a certain beetle, a fairly good crop was produced.

The beetle referred to is doing a lot of harm to the tobacco produced in the district and is receiving the attention of the Entomological Division. We propose planning a series of spraying experiments for next season, with the hope of finding a means of controlling this pest.

Itinerant Officers.—The Itinerant Officers in the Western District, Cape Province, and Natal, received and despatched 409 and 4,407 letters and telegrams respectively, in addition to forwarding the regular monthly returns and reports. These officers devoted their entire time to itinerant work. In fact the Itinerant Officer in Natal was so overwhelmed with requests that it was a physical impossibility for him to meet all of the demands. During this time he also gave 33 lectures.

Orange Free State.—Unfortunately we have been unable to secure the services of a suitable man to supervise the tobacco work in the Orange Free State. Consequently, that Province has been neglected now for more than twelve months and, too, at a most critical period of the industry's progress. Negotiations are now in progress to secure an officer for this area.

W. H. SCHERFFIUS,
Chief: Tobacco and Cotton Divison.

REPORT No. XI.

DIVISION OF HORTICULTURE.

Staff.—The Staff of this Division is practically the same as last year.

(1) The Chief of the Division—I. Tribolet	Headquarters, Pretoria.
(2) 1 Itinerant Horticulturist—R. Le Sueur	Grahamstown.
(3) 1 Fruit Inspector—W. Roworth	Cape Town.
(4) 1 Clerk at Docks—C. Edmonds	Cape Town.
(5) 1 to 3 coloured boys in fruit store at Docks	Cape Town.
(6) Grain Grader, doing fruit inspection without remuneration—James Murchie	Port Elizabeth.
(7) Grain Grader, doing fruit inspection without remuneration—E. Powell	East London.
(8) Collector of Customs, doing fruit inspection without remuneration—W. Griffith	Mossel Bay.
(9) 1 Fruit Inspector doing the work at a percentage remuneration—C. H. Morrison	Durban.

The Horticultural Staffs at the Agricultural Schools are additional to the above officers.

Work of the Division.—During the period under review the following duties were performed: *Correspondence*: Approximately 1,000 letters were received and replied to. *Personal Visits*: Two hundred and fifty personal visits were paid to farms as under:—

Transvaal.—Northern and North-Eastern Haenertsburg, Pietersburg, Nelspruit and rest of Barberton district, 80; Rustenburg district, 20; other areas such as Johannesburg, Pretoria, Potchefstroom, Zeerust, etc., 40.
Cape.—Drakenstein and Somerset West, 10; Paarl, 10; Eastern Province of the Cape, 36.
Orange River.—Upington, Keimoes, Kakamas, 40.
Natal.—Golden Valley Coastal belt, 10; Orange Free State, 4.

Inspections.—The following schemes were inspected and advised on:—Natal, Golden Valley; Cape, Sundays River, Wemmershoek, Langholm Estate; Transvaal, Witfontein, Homestead (Apple orchards), White River.

Shows.—Fruit sections were judged at the following Shows: Pretoria, Barberton, Rustenburg, Maritzburg, Haenertsburg, Tzaneen, Peddie, Rosebank, Port Elizabeth, Bremersdorp, and Hlatikulu.

In addition many matters were discussed with fruit farmers at these shows as well as at the Durban and Johannesburg Shows.

Lectures.—The lectures and demonstrations on horticultural matters were given at the undermentioned places:—Lydenburg Settlers, Eloff and Modderfontein, Upington, Keimoes, Louisvale.

Without exception the farmers proved keen on the subject and the attendance in most cases was good.

Meetings Attended.—Nursery and Seedowners Association, Kingwilliamstown; Western Province Fruit Farmers Association, Cape Town; Committee Meeting, Pretoria Exposition, Johannesburg.

Interviews.—Fruit merchants and exporters at Johannesburg, Durban, East London, Port Elizabeth, and Cape Town were interviewed. Also about 400 interviews at office—both in Pretoria and Cape Town, on horticultural matters, and in addition advice over telephone to 120 calls.

Administrative.—Carrying out of Fruit Export Act and arranging for running of the Division generally.

General.—The Inspectors are mostly kept busy at the Ports. When occasion allows of it, visits are made to the main fruit-growing export centres where advice is given in the form of lectures and demonstrations in the technique of packing and preparing the fruit for Overseas.

The Horticulturists at the Schools are working on somewhat similar lines to the Chief of the Division, but over restricted areas.

Since the destruction of the Citrus trees at the Government Experiment Station, Warmbaths, the property has been handed over to the Lands Department with certain reservations in regard to the few trees and vines that are still on the Station. However, the Horticultural Division having no ground whatever, the Agricultural Schools are doing work that was ordinarily in the past done by this Division, such as testing the relative merits of sprays, insecticides, washes, etc., testing and attending to either seeds or stocks imported by the Division from abroad, propagating olives, Smyrna and Capri figs and any variety of trees that have not yet been widely distributed amongst the farming community.

Statistics.—In regard to export for year ending 1919. The following quantities of fresh fruits have been sent overseas:—Fresh deciduous 89,151 boxes, value at £18,854; fresh citrus 54,677 boxes, value at £38,973.

The output of dried fruits amounted to 8,567,400 lb., of which 6,760,095 lb. were exported valued at £154,249.

	Boxes.	Value.
Export for 1918 : Fresh Citrus	4,176	£2,777
,, ,, Deciduous	41,696	11,016
,, ,, other kinds	2,437	1,291
Export for 1920 : Fresh Deciduous	265,298 boxes.	
,, Citrus	134,728 ,,	

I. TRIBOLET,
Chief for Horticulture.

REPORT No. XII.

GOVERNMENT VITICULTURIST.

Oenological Institute. Pure levures were again distributed among the farmers, and, according to reports, satisfactory results were obtained. Some new levures were imported from France, with which experiments are still being made. Many samples of wines and vinegar were analysed for private farmers and Government institutions.

Short Course Wine Making. The fifth course was held in January: 35 candidates actually booked, but only 21 attended. Influenced by the high price of wine they became indifferent. Dr. Perold, of the Stellenbosch University, and Mr. Cuthbert, Assistant Chemist at Elsenburg, assisted.

Staff.—Mr. Fevrier, Laboratory Assistant, who lately also acted as lecturer, left us to further his studies in Europe.

Outside Work.—I am still lecturing and generally supervising the viticultural work at Elsenburg and Mariendahl. That the Government Farms at Paarl and Constantia take up much of my time, can be seen from the fact that I actually spent 65 working days on these farms. During the year I visited 190 farms and lectured at Tulbagh, Paarl and French Hoek: 125 farmers attended. I acted as a member of the Commission appointed to investigate and report on the American Stocks, and accompanied the Principal of Elsenburg through Caledon, Villiersdorp and Worcester, to report on the best route to be followed for the new railway, linking up with the Caledon line.

American Stock: Experimental Plantations.—These plantations, in co-operation with the farmers are giving valuable results and are of great assistance in advising farmers as to the best stocks to be used in the different soils. Six new plantations have been added.

Viticultural Experiment Station, Paarl.—This station with its collection of nearly 200 varieties of grapes, remains a centre of attraction, and is visited by hundreds of visitors to inspect the grapes and make a study of the different methods of pruning, trellising, etc. The growing of export grapes is more and more taken up, hence this station is of great assistance in this respect. Several of the newer varieties are very promising, especially the "Zante Currant" lately imported. Thousands of cuttings were sold over the Union.

The quality of our wines at this station is keeping its reputation. The demands for our ports and sherries are bigger than we can supply. Those sold in bulk, topped the market by nearly £7 above the highest market price. The total revenue of this station was £580 7s. 2d. The expenditure (exclusive of Manager's salary) £334 9s. 5d.

Government Wine Farm, Constantia.—Lads are still trained here in Agriculture and more especially in Viticulture, Horticulture and Tobacco Growing. This is to meet the need of lads, whose parents are not in a position to send them to an Agricultural School. During the year 10 apprentices were admitted and 7 left. Some of these ex-apprentices have done remarkably well earning from £10-£20 as managers and foremen on Government and private farms.

It is very satisfactory to note the improvements in growth and bearing, etc., of vines. The crop for 1919 was only 54 leaguers; the 1920 equalled 108 leaguers. Although this is very encouraging, yet it will be some time before the vineyard will be up to the mark.

By careful pruning and cultivation the orchards show a decided improvement. However, in the near future, the greater part will have to be renewed as the trees are very old. A peach orchard was planted and is very promising.

The farm generally is improving, yet much has still to be done. Worthless vines and fruit trees were uprooted, and will be replaced next year. The Tobacco growing was a fair success and will be extended next year. About 2 acres of badly washed land were tilled, drained and recleaned. Six acres of hillside land were planted with forest trees and 7,800 gallons of wine fit for export, were sold to a London firm. Wines were also exhibited at the London Colonial Wine Exhibition, two prizes being awarded us. The total revenue of this estate was £4,521 3s. 10d. Expenditure (excluding Manager's salary), was £2,165 6s. 9d.

General.—The 1920 crop is estimated to exceed the 1919 crop by 30,000 leaguers of wine. The crop was heavier than anticipated. Prices were from £10-£12 per leaguer towards the end of 1919, gradually increasing until it reached £30 in January, 1920. There was a good demand for well matured wine fit for export, but only a small quantity was obtainable.

Plantings.—On account of high prices for wine, there was a big demand for grafted vines, chiefly for wine making varieties, the demand for table varieties being fair.

Diseases.—Owing to a dry summer the vineyards did not suffer much from diseases.

Export of Grapes.—The export of grapes to the London market seems to be very promising and many viticulturists who have not yet made use of this market intend to do so in the future. It is not unusual to clear £100 on a ton of grapes shipped. Even if prices should drop considerably, it will still be a profitable undertaking.

S. W. VAN NIEKERK,
Government Viticulturist.

REPORT No. XIII.

DIVISION OF CO-OPERATION.

New Societies.—Ten new Societies were registered two in the Transvaal and eight in the Orange Free State. Seven of these devote themselves to the sale of members' produce and the supply of farming requisites, two supply their members with dairy cattle, and one has not yet started operations.

Removal of Societies from Register.—Three Societies were removed from the Register of Co-operative Agricultural Societies, namely, Excelsior Ko-operatieve Zuivel Vereniging, Koolspruit Ko-operatieve Vee en Zuivel Vereniging, and Manitoba Ko-operatieve Zuivel Vereniging. Their dissolution involved no loss to the members.

The Number of Active Societies is thirty-seven, as shown in the following table:—

	Produce and Implements.	Cheese Factory.	Dairy Cattle.	Threshing.	Tobacco.	Total.
Transvaal	14	—	2	1	1	18
Orange Free State ..	11	2	6	—	—	19
Total	—	—	—	—	—	37

Progress made by Societies.

Maize.—The operations of the Maize Societies have, with a few exceptions, resulted in a profit, while the prices paid to members on their produce were also very satisfactory. The advances for the 1919-20 season were fixed at 12s. per bag for Government grade No. 2 and 11s. 6d. for grades 3, 4, 5 and 6. The prices ultimately paid to members, including the advances, averaged about 19s. on the best white and yellow grades. The Co-operative Maize Societies control, as yet, only a fractional part of the Union's crop, as is evidenced by the fact that up to about the middle of January the societies had received 567,827 bags, of which 536,961 bags were sold, while the Union's maize crop for the 1919-20 season was estimated at approximately 8,000,000 bags. It is gratifying to be able to report that the hard and continuous fight put up by this Division against the evils of the credit system, has met with so much success that the number of societies which are to-day still handicapped in their operations by outstandings, has been reduced to about four and that the position of these societies is continuously improving. During my tenure of office as Registrar, I have made it a rule not to register any society which has not adopted a cash system.

Tobacco.—Rarely has the principle of co-operative selling met with a finer justification than in the case of the Magaliesberg Tobacco Society. The present membership is close on 3,000. The prices realised by members on their tobacco during the past financial year were even higher than those obtained during the previous year. In addition, the Society was able to add a further sum of £8,475 0s. 11d. to its Reserve Fund, which now stands at £29,997 4s. 9d.

Threshing.—So far only one society has been formed exclusively for the purpose of threshing members' grain, viz., the Olifantsrivier Ko-operatieve Dorschwerk. This it has been able to do at rates considerably below the ordinary. The Society has also accumulated a Reserve Fund of £1,668.

Cheese.—While it cannot be doubted that the manufacture of milk into cheese and the disposal thereof under a co-operative system can be carried out beneficially to the producer, the co-operative cheese societies have nevertheless not met with much success. The first society of this kind was established at Kestell three years ago, and although at first its prospects seemed very bright, subsequent bad management had the effect of creating disloyalty among members to such an extent that the society had to go into liquidation. During the first year of its existence, when there were fewer societies requiring supervision and a larger staff of inspectors than at present, it was possible for this Division to devote proper attention to this pioneer society. The following year, owing to the rapid extension of the movement and the number of new societies established, the Kestell Society could not be visited by the inspectors as frequently as I should have wished, while in the third year, when the number of societies had still further increased and my staff of inspectors had become still more depleted, it was impossible to conduct an inspection of this society's affairs until the end of the financial year. It was then found that during that year the society had been so grossly mismanaged that recovery was impossible. The cheese society formed subsequently at Excelsior met with a similar fate, and the one at Hobhouse will, probably, also be dissolved shortly.

Dairy Cattle.—With one exception (Kopjes), these societies are as yet only engaged in supplying their members with thoroughbred bulls and cows of good milk-producing breeds. Two of these societies were dissolved owing to the reduction of their membership below the minimum required by the Co-operative Act. The remaining societies have worked with a fair measure of success and with considerable benefit to the members.

Cotton.—Only one society, the Rustenburg Boeren Ko-operatieve Vereniging as yet undertakes the handling and selling of members' cotton. Very excellent results have attended the operations of this society, both as regards the quantity of cotton handled and the prices realized. When the society succeeds in acquiring the necessary plant for extracting the oil from the seed, even better results may be expected. The Waterberg Society is also contemplating the establishment of a cotton branch, but has not yet been able to obtain the necessary plant. Meanwhile, the cotton is being sent to Rustenburg for ginning and sale.

EXTENSION OF MOVEMENT.

During the period under review ten new societies were registered, nine of which are already actively engaged in the transaction of business, viz.: Middelburg Ko-operatieve Vee en Zuivel Vereniging, Ladybrand Ko-operatieve Landbouw Vereniging, Bethlehem Ko-operatiewe Landbouw Vereniging, Tonteldoos Ko-operatieve Vee en Zuivel Vereniging, Reitz Ko-operatieve Landbouw Vereniging, Ficksburg Ko-operatieve Boere Vereniging, Clocolan Ko-operatieve Landbouw Vereniging, Wepener Ko-operatieve Landbouw Vereniging, Heilbron Boeren Ko-operatieve Vereniging.

Seven of these devote themselves to the sale of members' produce and the supply of farming requisites, and two are dairy cattle societies.

At the time of writing, three new societies have been established. This brings the total number of active societies at the present moment up to 39, as compared with 17 four years ago.

A great development of the movement has taken place in the Orange Free State. For a number of years there was only one active society in that Province, whereas to-day there is a co-operative society in almost every one of the principal maize districts. In the establishment of these societies, co-operators were able to benefit by the experience of the older societies in the Transvaal and to avoid many of the pitfalls into which the latter had fallen. Upon my advice they have all adopted the cash system in connection with their business, and the results so far achieved have been eminently satisfactory.

Farmers are continuing to display a keen interest in the establishment of dairy cattle societies. That the dairy industry will greatly benefit by this form of co-operation is beyond question, but there is an element of danger in this connection, by reason of the fact that farmers are inclined to lose sight of the real object of these societies, and merely to look upon them as a simple method of acquiring ordinary live stock. The matter is, therefore, one which calls for the closest supervision on the part of this Division. The number of active societies of this kind at present is eight.

A great forward movement has also taken place in regard to co-operation in wool. More wool has been handled by the existing societies than during any previous year, and there is a tendency towards closer supervision which will, probably, shortly result in the formation of a central wool organisation.

TURNOVER OF SOCIETIES.

	1918.	1919.
Produce—		
Maize sold	784,615 bags.	763,807 bags.
Tobacco sold	1,534,621 lb.	2,795,641 lb.
Cheese sold	141,602 lb.	86,532 lb.
Other (Value)	£142,536	£153,317
Farming Requisites—		
Value of machinery, etc., sold to members ..	£172,356	£152,268

MEMBERSHIP OF SOCIETIES.

The total membership of the societies was 10,141. During the year there were 1,279 additions and 728 withdrawals.

POSITION OF INDIVIDUAL SOCIETIES.

Name of Society.	PRODUCE SOLD.		Farming Requisites Sold.	LAND BANK ADVANCES.					REMARKS.
	Maize (Bags).	Other (Value).		Instal-ment.	Cash Credit.	Amount Owing			
						At	On Instalment.	On Cash Credit	
Bethlehem	—	—	—	—	—	—	—	—	One of the new societies established during the period under review. Its prospects are very encouraging.
Centraal-Westelike ..	163,505	£2,815	£27,071	£5,000	£95,000	31/5/19	£3,750	£15,762	Has continued to make good progress.
Clocolan	—	—	—	—	—	—	—	—	A newly established Society.
Ermelo	25,750	29,742	12,270	13,000	22,000	31/12/19	6,750	9,191	In a satisfactory position.
Ficksburg	—	—	—	—	—	—	—	—	A new Society with good prospects.
Frankfort	52,300	Nil	4,888	2,000	25,000	31/5/19	2,000	111	Established two years ago and is making very good progress.
Heilbron	—	—	—	—	—	—	—	—	Registered at the beginning of the year under review, but did not commence operations until the following maize season owing to lack of building sites. Has now started business and. with good management, should prove a great success.
Heidelberg	25,720	4,267	4,732	Nil	30,000	31/5/19	Nil	6,461	The loyalty of the members is not as good as could be wished.
Hobhouse	—	831	—	800	—	30/9/19	800	—	Has had difficulties to contend with and it is doubtful whether it will be able to survive.
Hoogeveld	27,375	700	5,026	10,000	39,000	31/5/19	813	20,471	Has not yet fully recovered from the results of the mismanagement of a few years ago.
Kestell	—	3,320	—	2,625	4,000	30/9/19	2,375	2,379	Will probably have to go into liquidation as a result of excessive mismanagement.
Kopjes	—	—	—	—	2,500	31/8/19	—	1,641	Making very good progress.
Koster	25,144	2,898	10,180	1,000	34,000	30/6/19	333	10,500	The satisfactory progress indicated in the last report has been maintained.
Ladybrand	—	—	—	—	—	—	—	—	This new Society has already commenced active operations.
Lichtenburg	130,080	13,093	30,787	11,000	28,000	31/5/19	6,477	23,547	Is meeting with reasonable success, but is still rather handicapped by the large amount of the outstanding debts.
Lindley Boeren ..	73,261	1,091	3,231	9,000	54,000	31/5/19	5,000	4,590	The good expectations in regard to the future expressed in the previous report have been realised.
Lijdenburg	7,410	36,500	4,500	Nil	3,500	31/5/19	—	1	Complete success continues to attend the operations of this Society.
Magaliesberg ..	—	88,339	—	Nil	Nil	—	Nil	Nil	The satisfactory progress indicated in previous reports has been maintained. The Society has now a reserve fund of close on £30,000.

Name of Society.	PRODUCE SOLD.		Farming Requisites Sold.	LAND BANK ADVANCES.					REMARKS.
						Amount Owing			
	Maize (Bags).	Other (Value).		Instal-ment.	Cash Credit.	At	On Instalment.	On Cash Credit	
Marico	1,193	£8,282	£1,374	Nil	£5,000	30/6/19	—	£3,368	The position has somewhat improved during the past year, but it remains to be seen whether sufficient headway will be made in the near future to justify its existence.
Middelburg	42,000	10,955	15,848	2,500	42,000	30/6/19	2,344	37,672	The outstanding accounts are still unduly large.
Olifantsrivier ..	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Carries on threshing operations and is doing well.
Pretoria Landbouw ..	,,	,,	,,	,,	,,	,,	,,	,,	The future of this Society, which is transacting practically no business, is now being considered. If dissolution is decided upon there will be about £700 for distribution among members.
Reitz	46,704	,,	120	5,000	45,000	31/12/19	2,400	10,500	Has now brought out its first financial statements, which show a profit of £305 1s. The price paid to members for their produce was highly satisfactory.
Rustenburg Boeren ..	1,565	16,256	3,605	7,000	37,000	31/1/20	3,413	18,588	There has been appreciable improvement in the position of this Society during the past year.
Senekal	36,308	—	1,545	4,000	50,000	31/5/19	1,925	1,762	Has done very well and its future can be regarded with confidence.
Standerton	30,000	5,000	7,300	8,100	45,000	31/5/19	1,741	18,133	The position of the outstandings has been improved, but they are still too heavy. A good profit has been shown on the year's working.
Vrede	22,412	11,791	9,643	2,250	27,750	31/5/19	1,969	12,759	The general position has been improved, but the outstandings, although considerably reduced, are still too heavy.
Waterberg	6,295	1,104	2,083	1,000	5,000	31/7/19	563	1,775	The position of this Society is now quite sound, and its prospects for the future are good.
Wepener	—	—	—	—	—	—	—	—	Established during the year and has already commenced operations.
Wolmaransstad ..	39,185	8,822	8,065	Nil	19,000	31/5/19	Nil	14,996	This is a fairly sound and steadily improving organisation. A profit of £1,173 4s. 3d. was made on the year's working.
Aasvogelkrans, Lindley Vee en Zuivel, Valsch River Cattle and Dairy, Kestell Vee en Zuivel, Middelburg Vee en Zuivel, Tonteldoos Vee en Zuivel		—							With one exception (Kopjes) these Societies are as yet only engaged in supplying thoroughbred bulls and cows of good milk-producing breeds to members.

Table of Assets and Liabilities.

SOCIETY.	LIABILITIES.						ASSETS.							
	Land Bank.	Local Bank.	Sundry Creditors.	Produce to be Credited to Members.	General Reserve.	Reserve for Bad and Doubtful Debts.	Properties less Depreciation.	Plant less Depreciation.	Stocks on hand.	Sundry Debtors, Members.	Sundry Debtors, Non-Members.	Central Agency.	Cash.	Stocks Produce.
	£	£	£	£	£	£	£	£	£	£	£	£	£	£
Aasvogelkrans	1,960	—	—	—	—	—	—	—	—	1,960	—	—	—	—
Centraal Westelike ..	19,512	3,232	61	122,060	5,477	750	5,475	974	14,086	119,538	75	7,398	23	3,523
Ermelo	15,941	—	5,617	1,679	7,168	190	4,017	2,486	5,036	7,541	4,648	2,953	1,694	2,220
Frankfort	2,111	—	4,516	5,476	1,252	—	1,696	125	1,117	3,830	750	—	5,247	590
Heidelberg	6,460	1,279	4,625	—	1,640	—	3,140	298	5,929	3,821	58	754	4	—
Hobhouse Zuivel ..	800	242	20	—	40	—	152	375	498	—	77	—	—	—
Hoogeveld-Eendracht ..	21,284	1,075	3,446	—	5,407	1,163	9,336	408	7,314	13,796	234	1,277	10	—
Kestell Vee en Zuivel ..	2,025	—	12	—	3	—	—	—	—	2,025	—	—	15	—
Kestell Zuivel	4,758	—	453	—	610	—	2,229	919	799	867	520	—	487	—
Kopjes Vee en Zuivel ..	1,641	—	216	—	86	—	—	—	7	1,878	25	—	33	—
Koster	10,833	—	624	—	592	—	996	423	3,321	6,785	105	201	218	—
Lichtenburg	30,024	2,552	7,347	—	8,415	3,281	13,045	708	3,150	26,507	1,467	1,352	1	5,389
Lindley Boeren	9,590	—	217	3,421	225	—	4,912	396	3,339	302	779	25	652	3,048
Lijdenburg	1	—	4,682	—	11,650	572	1,113	89	1,815	6,438	—	—	7,450	—
Magaliesberg Tabak planters	—	—	11,918	40,724	29,997	—	6,222	306	—	818	5,235	—	41,274	28,784
Manitoba Vee en Zuivel	2,045	—	30	—	—	—	—	—	—	2,045	—	—	30	—
Marico	3,368	—	693	—	83	279	476	79	359	2,870	182	—	457	—
Middelburg Landbouwers	40,015	—	3,315	—	4,486	1,890	4,254	644	10,304	22,777	860	877	5,269	4,721
Olifantsrivier Dorschwerk	—	261	142	—	1,668	150	—	1,022	—	1,153	—	—	46	—
Pretoria	—	—	58	—	718	1,130	—	2	2	1,113	24	50	715	—
Rustenburg Boeren ..	22,001	—	3,166	—	3,177	—	5,853	1,082	1,526	2,289	1,987	—	1,272	14,335
Senekal	3,687	—	1,548	6,614	186	—	1,993	366	4,171	1,456	498	25	830	2,696
Standerton	19,874	—	5,965	—	4,539	1,403	6,531	156	6,400	16,293	1,038	977	386	—
Unie Vee en Zuivel ..	4,289	—	37	—	33	—	—	—	—	4,277	—	—	82	—
Vrede	14,727	—	4,325	—	3,957	1,460	2,955	470	4,185	11,928	888	—	4,043	—
Waterberg	2,337	—	806	—	673	482	380	86	635	982	205	516	288	1,206
Wolmaransstad	14,996	—	2,181	49	4,126	900	5,166	311	4,095	6,140	273	4,637	905	725
	254,279	8,641	66,020	180,023	96,208	13,650	79,941	11,725	78,088	269,429	19,928	21,042	71,431	67,237

Statement of Administration Charges and Turnovers of Societies during the last Financial Year.

Society.	Turn-over.	Salaries and Wages.	Interest and Bank charges.	Rent	Station-ery.	General ex-penses.	In-surance.	Audit Fees.	Tele-phones.	Travel-ling ex-penses.	Re-pairs.	Direc-tors' Fees.	Legal ex-penses.	Depre-ciation.	Hessian and packing.	Total.
	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£
Centraal Westelike	192,886	2,152	—	137	46	923	130	73	25	145	—	—	6	795	—	4,432
Ermelo	67,762	1,877	405	216	46	329	112	—	34	27	172	—	12	466	—	3,696
Frankfort	57,188	1,046	100	77	28	137	94	—	14	8	—	—	—	114	—	1,616
Heidelberg	34,719	1,165	167	5	20	89	45	50	49	23	10	45	—	32	—	1,700
Hobhouse Zuivel	832	171	26	—	6	44	—	—	—	—	—	—	—	—	—	247
Hoogeveld-Eendracht	33,101	1,665	337	82	72	123	131	63	—	118	11	70	173	64	—	2,909
Kestell Zuivel	3,553	707	222	—	14	232	24	—	—	—	11	21	—	301	—	1,532
Kopjes Zuivel	—	60	—	—	12	10	—	7	—	3	—	—	—	—	—	92
Koster	38,222	1,116	9	33	55	43	21	50	—	11	—	51	—	159	—	1,548
Lichtenburg	173,960	2,975	2,291	115	91	177	279	98	60	132	—	86	31	84	—	6,419
Lindley Boeren	77,583	1,068	174	22	43	108	172	—	19	75	—	—	2	263	—	1,946
Lijdenburg	48,410	987	19	—	—	254	—	—	—	—	—	—	—	134	—	1,394
Magaliesberg	88,340	4,798	279	125	148	456	244	75	—	112	66	426	—	537	2,999	10,265
Marico	10,849	429	68	17	—	75	13	35	9	—	—	49	49	—	—	744
Middelburg Landbouwers	68,803	1,500	871	47	64	311	153	68	—	29	—	152	—	68	—	3,263
Olifantsrivier Dorschwerk	—	355	—	—	—	47	—	32	—	27	163	69	—	118	—	811
Pretoria	—	—	211	—	—	66	—	—	—	—	—	62	—	—	—	339
Rustenburg Boeren	21,426	651	307	—	114	275	119	50	42	106	—	133	19	256	—	2,072
Senekal	37,853	1,128	63	70	22	127	80	—	—	32	—	—	1	288	—	1,811
Standerton .. .. .. }	42,300	1,737	252	—	67	295	89	56	68	193	31	104	21	431	—	3,344
Standerton Butchery Branch .. }	—	—	28	—	—	662	—	—	—	—	—	—	—	—	—	690
Vrede	43,846	1,425	21	72	50	275	80	42	22	140	—	165	13	275	—	2,580
Waterberg	9,482	529	71	8	17	34	45	30	—	16	90	42	—	171	—	1,053
Wolmaransstad	56,072	703	70	—	42	127	32	37	—	87	17	46	8	177	—	1,346
	1,107,187	28,244	5,991	1,026	957	5,219	1,863	766	342	1,282	571	1,521	335	4,733	2,999	55,849

Central Agency for Co-Operative Societies, Limited.

Good progress is being maintained by this institution, while it also continues to exercise valuable consolidating influence upon the affiliated societies. At 30th June, 1919, the accumulated profits and reserves amounted to £16,808 7s. 5d., as compared with £11,701 at the end of the previous financial year.

Annual Co-Operative Congress.

The Seventh Congress of representatives of Co-operative Societies in the Transvaal and Orange Free State Provinces was held in Pretoria recently. A report of the proceedings in English and Dutch, will shortly appear in the "Agricultural Journal."

JOHS. RETIEF,
Registrar of Co-operative Agricultural Societies.

REPORT No. XIV.

DIVISION OF AGRONOMY (INCLUDING DRY-FARMING.)

General. The principal functions of the Division were set forth in last year's report and the programme of work framed thereunder has been carried out as far as possible with the very small staff at my disposal.

Itinerant Work and Staff.—The demand for the services of the Division from Agricultural Societies, Farmers' Associations, farmers and prospective farmers from many parts of the Union, was again so great during the period under review, that it was not possible for me to comply with half of the requests received. I am the only lecturer of my Division. Besides I have to attend to a very heavy correspondence, direct the experiments and the general run of the Division, supervise an extensive co-operative system, attend agricultural congresses, shows and disseminate advice to many individual farmers. In spite of the increased demand on the part of the public for information and investigation regarding agricultural matters of economic importance and in spite of the great number of farmers who every year clamour in vain for the Division's assistance, and notwithstanding my repeated appeals over a number of years for technical, or at least practical, assistance, I regret to state that I am still alone. During the months of April, May and June, my staff were busy visiting the various Agricultural Shows in the Union in connection with the exhibits from the Dry-Land Station, Pietersburg. Lectures were given and the judging of products undertaken. Applications from many farmers for seed on the usual co-operative line were attended to. The usual harvesting and planting of crops was conducted on the Experiment Station, of which results will appear in the Journal of the Department of Agriculture.

During the period under review, Mr. W. Kotze, the foreman at Pietersburg Station, died, and Mr. Probart was appointed in his place.

Co-operative Experiments with Farmers.—The object of co-operative experiments with farmers was fully explained in last year's report. The system is becoming very popular with the farming community and we are meeting with more success and encouragement as time goes on. We have, during the financial year, supplied various seeds to 401 farmers, who have conducted 1,028 experiments in 140 districts. The seeds returned to us by some farmers are not always free from seed of other varieties or of weed seeds. The names of senders of impure seed are generally removed from our list of co-operative experimentalists, but these are not many.

Rye.—We have succeeded in interesting many farmers in the production of this cereal, which is botanically and physiologically most closely comparable with wheat. It can be grown in the drier parts of the Union with more safety and less care than wheat, because it resists drought and rust better than most types of the softer wheats and will make a fair growth on soils which are too light or poor for wheat, oats, barley or maize. An article on rye will appear in the Journal of the Department of Agriculture.

Emmer Wheat (Rust Proof), *Hajira* oats, *Sudan* and *Kikuyu* grass have been grown by many farmers with great success. Black Don wheat has again done exceedingly well as a spring or summer variety.

Sorghums.—Twelve varieties, both for grain and silage purposes, did very well.

Pea Nuts and *Buckwheat* have gained much ground and we will issue more seed of these useful crops this season. Nuts sell at comparatively high prices since the war. Buckwheat is also a fairly safe summer crop and an article which can help a farmer in very many ways.

Sahara Yellow Maize and *Golden Nugget No.* 9 have done very well.

Beans for human consumption are greatly in demand both in this country and overseas. We are this coming season issuing the best varieties to the best co-operative experimentalist farmers.

Apples (late varieties) and *Quinces*: The excellent success with which our apple growing experiments both at Lichtenburg and Pietersburg have been crowned, resulted in an awakening of progressive farmers to the great possibilities of apple growing on dry lands in districts with a fairly high altitude. More farmers have started growing quinces (not in hedges) and they find both apples and quinces profitable and the trees drought resistant when planted and brought up under dry farming methods.

PIETERSBURG DRY-LAND EXPERIMENT STATION.

This Station, under the capable management of Mr. G. H. Trollope, has become a great source of information to farmers in the vast Zoutpansberg area. Many more progressive farmers from other parts of the Union have, during the year, bought farms up north and the great interest displayed in this Institution is very gratifying. Others again want us to keep some thoroughbred animals, as an experiment, to ascertain which breeds will do in that great and unique area.

In conclusion I wish to point out that, during the 10 years of experimentation on different stations, (all the stations excepting Pietersburg have been closed down owing to lack of funds and proper staff) in various parts of the country, there has not been a year—even in the face of many prolonged and severe droughts and other calamities—that any established station showed a complete failure in all crops. A list of crops experimented with is appended. The results of the experiments will be published in the "Journal of the Department of Agriculture."

CROPS GROWN ON THE DRY-LAND EXPERIMENT STATION, PIETERSBURG, DURING THE PERIOD UNDER REVIEW.

Mangel Wurzel, Mammoth Long Red, Broom Corn Mellet, Boer Manna, Red Manna, Cow Peas Wonder, Sorghum and Kaffir Corn, Soudan Grass, Teff Grass, Beans.

Winter Feeds.—Swedes, Rape, 1,000 head, Kale and Chomoelier, Grasses and Clovers, Sugar Beet, Jerusalem Artichokes, Kikuyu Grass, Napier Fodder.

Saltbush.—Atriplex Semibaccata, Oldman.

Wheat.—Black Goose, S.A. Medeah, Wild Goose, Bont Aar, White Polish, Yeoman, Klein Koren, Gavi, Early Gluyas, Sunset.

Maize.—Hickory King, Iowa Silver Mine, White Cango, Minnesota 133, Sahara Yellow, Yellow 8 row flint, Pride of Saline, Summer Wheat, Black Don, Summer Oats, Hajira Oats, Kaffir Melons, Sunflower Multiflora. Comparative Row Tests, 63 varieties.

H. S. DU TOIT,
Government Agronomist.

REPORT No. XV.

GOVERNMENT GUANO ISLANDS.

The period covered by this report has been the most successful, both financially and otherwise, in the annals of the Guano Islands undertaking.

The activities of this Division were, during that period, confined to the collection, sale and distribution of guano, the disposal of the balance of the Cape Cross Guano Phosphate, and sealing operations, and records have been established in regard to each of these.

The total quantity of guano obtained from all sources during the season 1919, was, approximately, 8,928 tons, or an increase of 916 tons, as compared with the previous year's crop, and the total number of Seal Skins taken during the same year was 8,166, as against 7,143 in 1918.

Further records were also established in the sale and distribution of guano. The figures for the calendar years 1918 and 1919 were 7,060½ and 8,554½ tons, respectively.

Referring to the distribution of the guano, owing to the continued enormous demand therefor, this is still being disposed of by allotment.

Allotment and Sale of Guano.—The total quantity of guano disposed of during the whole period covered by this report (1st January, 1919, to 30th June, 1920), was 15,581 tons.

Three allotments in all were made, viz., one in February, 1919, which has already been referred to and been fully dealt with in my report for 1918-19, another early in July—being the second distribution for that year and in which 1,500 tons were disposed of,—and the third (being the first allotment for the current calendar year) early in February, 1920, when 7,010½ tons were allocated amongst the successful applicants.

No restrictions, with regard to the purposes for which guano could be applied for, were imposed in respect to either of the latter two allotments and in response to the notices advertising the same, 2,455 applications, for a total quantity of 4,798 tons, and 3,505 applications, for 21,732½ tons, were received and considered in connection with the respective allotments.

As the result of scrutiny in respect to the July allotment, 46 applications were disallowed and the total quantity applied for by the remaining applicants was reduced to 34,148 bags (3,415 tons).

With regard to the February, 1920, allotment, 72 applications were disallowed and the total quantity applied for in the remaining applications was reduced to 17,723½ tons.

Cape Cross Guano Phosphate.—Owing to the many and almost insuperable obstacles which Mr. Hausmann had to contend with, in his endeavour to complete his contract with the Government for the supply of 4,000 tons of Cape Cross Guano Phosphate and which was referred to in my report for 1918-19, it was not possible for him to fulfil his obligations, in respect thereto, until the middle of May last.

As stated in that report, 1,800 tons of this Phosphate were advertised for disposal, by allotment, in February, 1919, which was freely applied for at the time, but for some reason or other, after this quantity had been apportioned amongst the applicants, allotments were not taken up as readily as was anticipated and many were not taken up at all. In fact, it may be stated that, as the result of the deeply rooted and unwarranted prejudice which had arisen amongst the farming community against this fertiliser, very great difficulty was experienced in disposing of the large quantity of it on hand.

In consequence of this, recourse had to be had to the expedient of selling the balance (about 1,600 tons) out of hand, *i.e.*, over the counter. The whole stock was eventually disposed of towards the end of the year, but only after considerable personal effort and trouble on the part of myself and staff, in pushing its sale.

The total quantity of Phosphate sold during 1919 was 3,079 tons.

Revenue and Expenditure.—The total revenue from the sale of guano, Cape Cross Phosphate, seal skins, penguin eggs, etc. (exclusive of gratis issues of guano to other Divisions, valued at £1,120) for the financial year 1919-20 amounted to £304,619 0s. 7d., and the total expenditure for the same period including that incurred on the purchase of the Phosphate, but excluding free services valued at £82 7s. 2d., was £74,082 1s. 10d.

The expenditure and revenue in connection with the purchase and sale, respectively, of the Cape Cross Guano Phosphate, is charged and credited to Loan Vote Account.

Guano Production.—The conditions on the coast during the breeding season 1919-20 were all that could be desired from a guano-producing point of view, with the result that that season was an extraordinary good one and the resultant crop of guano will be the largest on record. From reports, which have been received from the various sources of supply, it is estimated that the total collections for 1920 will, in all probability, show an increase of very nearly a thousand tons on the record figures of 1919.

The following return shows the yield of guano and the quantities actually brought up to Cape Town from the various Islands and rocks under my control, during the calendar year 1919, as compared with the previous year:—

Island.	Collected.		Shipped to Cape Town.	
	1918.	1919.	1918.	1919.
Colonial Group.	Tons.	Tons.	Tons.	Tons.
Malagas Island	1,058¼	1,150	933½	1,119
Jutten ,,	430	774¾	430	762¾
Dassen ,,	257¼	771¼	257¼	771¼
Lamberts Bay Island	220¾	282¼	220¾	282¼
Bird ,,	217¾	280*	337¾	279¾
Dyers ,,	665¼	229¾	665¼	229¾
Paternoster ,,	44¼	72½	66¾	44¼
Elephant Rock	20	20¾	20¾	35¼
Seal Island	27½	Nil	27½	Nil
Totals	2,941	3,581¼	2,959½	3,524¼
Northern Group.				
Ichaboe Island	3,122	2,606	2,977½	2,304½
Possession ,,	900	1,278*	659½	1,266
Halifax ,,	325	450	630	325
Mercury ,,	324½	295	324½	295
Penguin and Seal Islands	140	252¼	Nil	392¼
Pomona Island	105	160¼	105	160¼
Sinclairs ,,	84	158	84	16
Plumpudding ,,	70	83	70	Nil
Long ,,	Nil	64	Nil	64
Totals	5,070½	5,346½	4,850½	4,823
Grand Totals	8,011½	8,927¾	7,810	8,347¼

*Roughly estimated.

The reserve stock of guano (being the balance left over of the 1919 crop) on hand on the 31st December last was, approximately, 4,566½ tons, of which quantity about 2,242½ tons were still remaining on the Islands on that date. The whole of this quantity, with the exception of roughly 80 tons on Bird Island, was thrown into the first allotment of 1920 and disposed of before the end of March of that year.

Demand for and Distribution of Guano.—There is no abatement in the enormous demand for this fertiliser, and, notwithstanding the fact that applications in connection with the February, 1919, allotment were restricted to the growers of wheat and rye only and that 3,079 tons of Cape Cross Guano Phosphate were sold and given for all purposes, the total quantity of Government guano applied for during 1919 was more than two and a half times as much as that available for distribution throughout that year.

Whilst there was a slight decrease in the demand from some of the larger districts, there was a further notable increase in that from Malmesbury, Paarl, Cape, Piquetberg and Ceres, as well as from some of the other centres. The demand from localities and the area of distribution outside of the limits of the Western and South-Western Districts of the Cape Province, remains more or less the same.

With regard to the Transvaal and Natal, there has been a falling off in the demand, whilst from the Orange Free State this has been slightly increased.

The total quantity of guano applied for during 1919 (including applications from other Government Departments) was 22,763 tons and the quantity disposed of in the same period was 8,554½ tons, 97·2 per cent. of which was absorbed by the Western and South-Western Districts of the Cape Province and, of that quantity, 7,760¼ tons were distributed between the Malmesbury, Paarl, Caledon, Cape, Piquetberg, Bredasdorp, Stellenbosch and Tulbagh Divisions alone.

The following statements show the quantities of guano sold and distributed to various centres in the Union during 1919, as compared with the year 1918:—

District.	Year.		District.	Year.	
	1918.	1919.		1918.	1919.
Malmesbury	17,719	22,729	Queenstown	Nil	13
Paarl	8,621	13,025	East London	,,	10
Caledon	13,538	12,943	Montagu	,,	10
Cape	4,272	9,218	Stutterheim	31	9
Piquetberg	1,361	5,958	Kubusie	Nil	6
Bredasdorp	7,046	5,644	Bathurst	,,	3
Stellenbosch	5,720	5,469	Aliwal North	3	2
Tulbagh	3,369	2,617	Kentani	Nil	2
Clanwilliam	1,861	2,072	Vryburg	,,	2
Ceres	551	1,296	Gordonia	,,	2
Worcester	750	1,037	Kimberley	,,	1
Swellendam	1,561	978	Port Elizabeth	160	Nil
Robertson	164	144	Kingwilliamstown	38	,,
Knysna*	87	116	Griqualand East	29	,,
Uitenhage	Nil	88	Cathcart	20	,,
Uniondale	,,	86	Alexandria	8	,,
Riversdale	16	80	Mafeking	5	,,
George	29	56	Cradock	2	,,
Humansdorp	Nil	51	*Transvaal*	2,151	1,281
Van Rhynsdorp	,,	25	*Orange Free State*	186	328
Mossel Bay	211	24	*Natal*	1,095	207
Laingsburg	Nil	13			
			Total Bags	70,604	85,545
			Total Tons	7,060½	8,554½

*Sold through the medium of the Guano Depot at Knysna, which is still being continued.

SUMMARY OF DISTRIBUTION.

	1918. Tons.	1919. Tons.
Cape Province.		
Western and South-Western Districts	6,653½	8,313
Other Districts	64	60
	6,717	8,373
Transvaal: All Districts	215	128
Orange Free State: All Districts	18½	32¾
Natal: All Districts	109½	20¾
Grand Totals	7,060½	8,554½

Analytical Composition of Guano.—The average analytical composition of the several stocks of guano, disposed of during the year 1919, was as under:—

Nitrogen, 11·2 per cent.; Phosphoric Oxide Soluble in Water, 3·5 per cent.; Phosphoric Oxide Soluble in 2 per cent. Citric Acid Solution, 10·5 per cent.; Total Phosphoric Oxide, 11·6 per cent.; Potash, 1·4 per cent.; Lime, 12·0 per cent.

Sealing.—Very successful sealing operations were undertaken on the South-West African Coast during the winter season, 1919, and also at Quoin Rock, on the South Coast.

The total season's catch was 8,166 skins, or a little over a thousand more than were obtained in the previous year, of which 6,476 were procured from our islands and rocks in the Northern Group, 906 from Elephant Rock and 784 from Quoin Rock. All these skins were shipped to the Trade Commissioner, in London, and sold.

Owing to the very great demand and keen competition for seal skins, extraordinarily high prices were obtained for the bulk of these skins, viz., 7,810, which were sold in London in January last, realising the very astounding sum of £172,808 1s. 3d., or an average of a trifle over £22 2s. 6d. per skin—the prices obtained for individual pelts ranging from 33s. to 670s.

This was undoubtedly a freak sale, as the prices obtained were phenomenal and quite unprecedented and were due entirely to the determined action on the part of certain

American Fur Houses in their endeavour to secure the sole control of the Seal Skin Trade and are not likely ever to be obtained again.

A further small consignment of 270 skins was disposed of in April for the sum of £1,463 4s. 6d., or an average of £5 8s. 4½d. per skin, which was also decidedly good and very much in excess of the prices obtained for these skins in normal times, before the War. A still later shipment of 80 somewhat inferior pelts—the balance of the season's catch—was sold in June at an all round price of 70s. per skin.

In addition to the foregoing, a consignment of 386 skins, being the balance of the 1918 season's catch, was sold at the auction sales in October, 1919, and realised the sum of £1,373 9s., or an average of £3 11s. 2d. per skin.

Seal Oil.—In addition to the seal skins, 4,804 gallons of seal oil were secured during the last season's sealing operations. This, together with the balance of the previous year's stock, has all been disposed of. There is a steady demand for this product and good prices are being obtained therefor. The total amount of revenue collected from this source during 1919 was £1,386 4s.

Sale of Penguin Eggs.—The collection of penguin eggs is still restricted to Dassen Island. The total number taken by the contractors during the season 1919 was 594,000, or an increase of 47,700 on the record figures of the previous season. The revenue derived from this source was £3,093 15s.

In conclusion, I desire to draw attention to the closing remarks in my report for 1918-19 and previous reports, regarding the pressing need for a departmentally-controlled steamer for the working of the Guano Islands. The necessity for such a vessel is becoming more apparent as time goes on and, now that the only vessels, which I have hitherto had to depend upon for carrying out the bulk of the work on the coast, have changed hands, I trust that consideration of the question of the acquisition of a Government-owned steamer for this service will not be much longer delayed.

W. R. ZEEDERBERG,
Superintendent, Government Guano Islands.

REPORT No. XVI.

CHIEF INSPECTOR OF GRAIN.

During the period under review, the total of all commodities exported amounted to 2,966,765 bags, made up as follows: Maize, 1,067,458 bags; Maize-Meal, 1,638,339 bags; Hominy-Chop, 5,825 bags; Kaffir Corn, 43,801 bags; Oats, 164,904 bags; Peas, 731 bags; Beans, 12,321 bags; Barley, 20,041 bags; Millet, 1,778 bags; Lucerne Seed, 8,462 bags.

Export of grain and grain products graded and inspected by this Division, was limited to a considerable extent in consequence of a predicted food shortage, caused by the drought, and in this connection, it is estimated that, approximately, 600,000 bags of maize in excess of the Union's normal requirements were distributed for human consumption and feeding of stock in the areas worst affected. The statistics supplied, therefore, in this report, do not represent normal expansion.

As in the preceding year, the major portion of the maize exported was sold under contract to the Imperial Government at 50s. per quarter of 480 lbs. f.o.b., equivalent to 19s. 9d. per bag f.o.r. country stations.

During the year, owing to the drought, and consequent possibility of a food shortage, the price of maize increased abnormally, and reached 33s. per bag of 203 lb. gross.

The large quantity of maize-meal exported was chiefly due to the mills of the United Kingdom being used for the milling of other products, and it is not anticipated, that the export of this commodity will continue when conditions revert to normal.

Grading at the ports continued as usual, and the efficiency of the grading staff has been fully maintained.

Maize exported during the year, compared favourably in quality with that exported in previous seasons, and in this connection, it is gratifying to be able to report, that rejections on account of unsoundness and other causes are on the decline.

During the War, owing to the scarcity and high cost of bags, the regulations in regard to re-bagging were somewhat relaxed. The Graders have now been instructed to revert to pre-war standard, and will, in future, inspect bags strictly in accordance with regulations.

Maize and Kaffir Corn standards were again made up in accordance with the export grades fixed by Government.

Following on resolutions passed at the last Grain Conference, maize-meal and oats have been standardized. Sets of all the commodities above referred to have been and still are being distributed to the public. The Trade Commissioner has also been supplied with bulk samples for distribution abroad.

The Annual Grain Conference met at Pretoria on the 21st July, 1919, presided over by the Secretary for Agriculture, and attended by representatives of Chambers of Commerce, Agricultural Societies, and other bodies interested in the maize industry. Mr. Little-John Philips, Consulting Engineer, appointed by the Government, to report on the location and design of elevators, was present. Mr. Philips invited discussion, heard the views of delegates, answered questions and explained the system and working of elevators generally.

With the exception of the discontinuance of the inland grading service (owing to the lack of public support) no other changes calling for special comment have taken place on the staff of this Division.

The expenditure in connection with the Division for the financial year 1919-1920 amounted to £5,862 4s. 8d. The revenue for the same period was £4,738 18s. 7d.

G. F. NUSSEY,
Chief Inspector of Grain.

REPORT No. XVII.

THE LIBRARY.

During the period under review the catalogue of the collection of books contained in the Central Library and the various Divisional Libraries was completed and is ready for printing.

The number of works received was 1,045 and 250 were bound, while 4,000 serial volumes were checked and completed. The number of complete bound volumes now in the Central Library amounts to 14,338 with, approximately, 8,000 serial volumes kept in the Library stores. The Bulletins, Leaflets, etc., in the Library total about 16,000 and, approximately, 36,100 works are deposited with the Division and School Libraries.

The binding has, as in previous years, been done free of charge by the Prisons Department, the material being paid for by the Government Printer. In addition to binding for the Central Library, some 154 volumes were bound for the Divisional School Libraries.

The number of Journals, Reports, Annuals, Bulletins, etc., subscribed to, exchanged or received gratis during the year was 1,975, against 1,810 received the year before.

4,091 people visited the Library, while the previous year the number was 3,910.

The correspondence amounted to 7,152 letters and advices sent out and 6,860 received as compared with the previous year's correspondence of 6,690 letters sent out and 6,350 received.

The scheme for lending books to the farmer was continued, the amount in deposits on hand on 31st March, 1920, being £229 17s. 6d. and the number of readers in each Province was as follows: Cape 45, Natal 22, Orange Free State 25, Transvaal 110, Swaziland 1, South-West Protectorate 2, Basutoland 1, or a total of 206 readers, against 233 readers the year before.

The staff of the Library consisted of the Librarian, two lady clerks, one of whom was engaged on work in connection with the publications issued by the Department, and a messenger, besides a temporary clerk to assist, during a few months in connection with the Library Catalogue.

Expenditure on Books during 1919-1920:

(1) For the Department:			
Complete Works	£801	6	6
Periodicals	632	19	6
Total	£1,434	6	0
(2) For the Agricultural Schools:			
Complete Works	£164	2	8
Periodicals	265	13	7
Total	£429	16	3
(3) For the Returned Soldiers' Training Farms:			
Periodicals	£6	8	2
Complete Works	42	14	3
Total	£49	2	5

Agricultural Publications issued by the Department.—These publications are divided into four classes, *i.e.*, General Series Bulletins and Local Series Bulletins, Science Bulletins and Press Circulars.

The General Series Bulletins were distributed in the Union and Oversea, 2,402 copies of each Bulletin being sent out.

The publications belonging to the local series were only issued to addresses within the Union amounting to 1,842 names.

The Press Circulars are issued to Newspapers and Farmer's Associations in the Union.

In addition to the distribution indicated above 3,468 applications for agricultural bulletins were received from private individuals, in compliance with which request some 48,888 bulletins on various subjects were sent. A number of these are now being sold, but others are still issued gratis. The proceeds of the sales totalled £108 4s. 11½d., which amount was paid to the Government Printer.

Altogether the Department published 6 General Series Bulletins, 9 Local Series Bulletins, 1 Science Bulletin and 26 Press Circulars.

PAUL RIBBINK,
Librarian.

REPORT No. XVIII.

BRANDS, ETC.

Registration of Brands.—During the period 1st April, 1919, to 30th June, 1920, 1,145 additional brands were registered in the Transvaal Province, 142 in the Cape, and 32 in the Orange Free State. 1,311 branding irons were supplied by the Government contractor during that period. £343 0s. 1d. was collected for registration fees and £920 0s. 6d. for branding irons supplied at cost price.

The total number of brands registered in each Province to the 30th June, 1920, is as follows: Transvaal, 22,043; Orange Free State, 1,590; Cape Province, 5,879; total, 29,512. (There is no Brands Act in operation in Natal).

Fencing.—280 applications have been dealt with under Act No. 17 of 1912 during the fifteen months referred to. Under section *nine* of the Act, 10 farms in Transvaal and 3 in Natal were ordered to be fenced for the purpose of preventing the spread of Stock Diseases.

Dipping Tanks.—245 applications for loans under the provisions of the Dipping Tanks (Advances) Act No. 20 of 1911, were dealt with during the period under review.

REPORT No. XIX.

ADULTERATION OF WINE, SPIRITS AND VINEGAR (ACT No. 15 OF 1913).

During the period 1st April, 1919, to 30th June, 1920, samples were purchased for analysis, in the following districts of the Union:—

Cape.—Adelaide, Alice, Cape Town, Caledon, Calvinia, Carnarvon, East London, George, Kingwilliamstown, Paarl, Piquetberg, Port Elizabeth, Queenstown, Somerset West, Stutterheim, Taungs, Uitenhage, Van Rhynsdorp, Victoria West, Vryburg, Wellington and Worcester.

Orange Free State.—Bloemfontein, Fouriesburg, Frankfort, Reitz and Thaba 'Nchu.

Transvaal.—Johannesburg, Roodepoort and Witbank.

Natal.—Durban, Dundee and Pietermaritzburg.

The samples purchased totalled 218.

The resuts of the analyses are shown in the table hereunder:—

Article.	No. of samples purchased.	Adulterated or deficient.	Incorrectly labelled.	Artificial or not genuine.	No. of prosecutions by samples.	No. of convictions by samples.
Brandy ..	156	87	15	—	80	58
Whisky ..	22	11	—	2	11	5
Gin	8	3	—	1	4	3
Wine	17	3	—	—	—	—
Vinegar ..	15	2	4	2	3	3
	218	106	19	5	98	69

In addition to the 218 samples purchased in the Union referred to above, 128 samples were analysed on importation with the results shown hereunder:—

Article.	No. of samples.	Adulterated or deficient.	Incorrectly labelled.	Artificial or not genuine.	Refused admittance into Union.
Brandy	12	3	2	—	2
Whisky	26	1	2	1	2
Gin	24	2	—	—	1
Wine	57	—	—	13	11
Rum	2	—	—	1	1
Vinegar	7	—	—	—	—
	128	6	4	15	17

	Price.	
	s.	d.
Factories Act 28 of 1918, Structural Requirements of the	0	6
Fencing Act, No. 17, 1912 (English and Dutch)	0	6
Field Cornet's Manual, 1904 (English)	2	0
French Refugees at the Cape, (Cloth) (C. Graham Botha)	5	0
Geodetic Survey of South Africa, Vol. I., 1894	7	6
Do. do. Vol II., 1899	10	6
Geslacht Register der Oude Kaapsche Familien :		
Vol 1, A-J, ½ Cloth .. .. nett	7	6
Do. ½ Calf	14	0
Vol. 2, A-O, ½ Cloth	7	6
Do. Cloth	11	6
.. ½ Calf	17	0
Vol. 3, P-Z, ½ Cloth	7	6
Do. Cloth	13	9
,, ½ Calf	20	0
1 Set Vols. 1, 2, and 3, ½ Cloth .. nett	21	0
Gazette, *Cape Govt.*, Proclamations and Principal Govt. Notices, Index to 1803-1881 ..	6	6
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